ELECTRICAL TIMES

THURSDAY
23 MARCH
1950
SIXPENCE

HENLEY *Modern*

DISTRIBUTION PILLARS AND PANELS

GROUP 24

Embodied in the new HENLEY Distribution Pillars are all those features that keen distribution engineers are looking for, together with a shell of modern pleasing appearance.

Robust cast-iron construction throughout with detachable plinth and roof.

Adequate provision for ventilation.

One-piece insulating right-angle type shields acting as phase barriers and vertical front shields for busbars.

Four sizes of Units are available, 200 to 1,000 amp, suitable for 3-phase 4-wire systems with cartridge fuse-link protection up to 60 amp for fifth core, if required. Units for other systems can be supplied.

One-piece insulators with specially designed entry to facilitate insertion or removal of conductor fittings.

Conductor fittings are reversible and interchangeable. Crossing of conductor cores is avoided.

Height 3' 11" above ground. Depth 14½".

Enquiries invited. Please ask for Folder 24/A.

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There's beauty in good lighting

THE FINISHING TOUCH....

ROYAL "EDISWAN" LAMPS

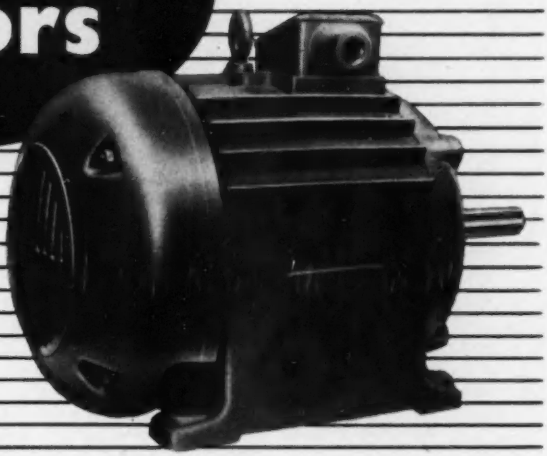
BY APPOINTMENT
SUPPLIERS OF ELECTRIC LAMPS
THE EDISON SWAN ELECTRIC CO. LTD.

THE EDISON SWAN ELECTRIC CO. LTD., 155 CHARING CROSS ROAD, LONDON, W.C.2

L101

Greater Efficiency brings lower prices

'ENGLISH ELECTRIC' motors



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for Screen-protected and Totally-enclosed fan-cooled Motors up to 15 h.p. The majority of these motors can be supplied ex. stock-24-hours' delivery.

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INDUSTRIAL MOTOR WORKS - - - - BRADFORD
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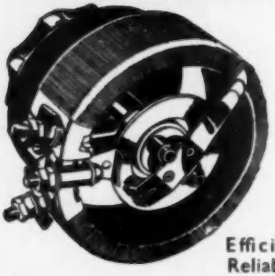

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15 AMPERE 3 PIN INSULATED AND IRONCLAD.
MADE TO THE USUAL BILL STANDARD - ROBUST, NEAT AND INCORPORATING AN ENTIRELY NEW METHOD OF CONTACT.

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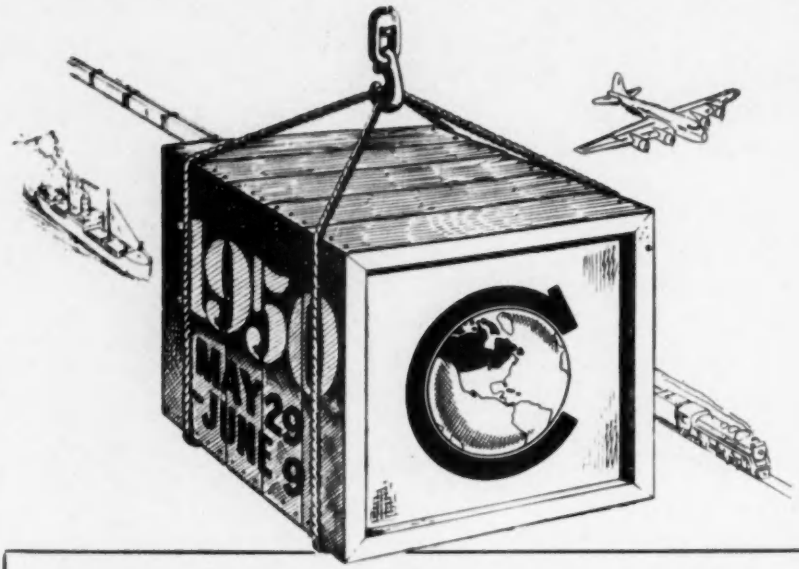

'TOO IMPORTANT TO MISS'

Offerings from five continents—in greater variety and volume—make this year's Canadian International Trade Fair a vital observation post and trading centre for businessmen of all nations.

The revaluation of currencies makes it more important than ever to compare world sources of supply, and see where your money buys the most. Shifting patterns of trade provide many opportunities to explore and establish new business connections.

Truly international—entirely devoted to actual business—packed with industrial goods, crammed with consumer products . . . for men of affairs everywhere, *the C.I.T.F. is too important to miss!*

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GLASGOW: J. L. Mutter, Canadian Government Trade Commissioner, 200 St. Vincent Street.

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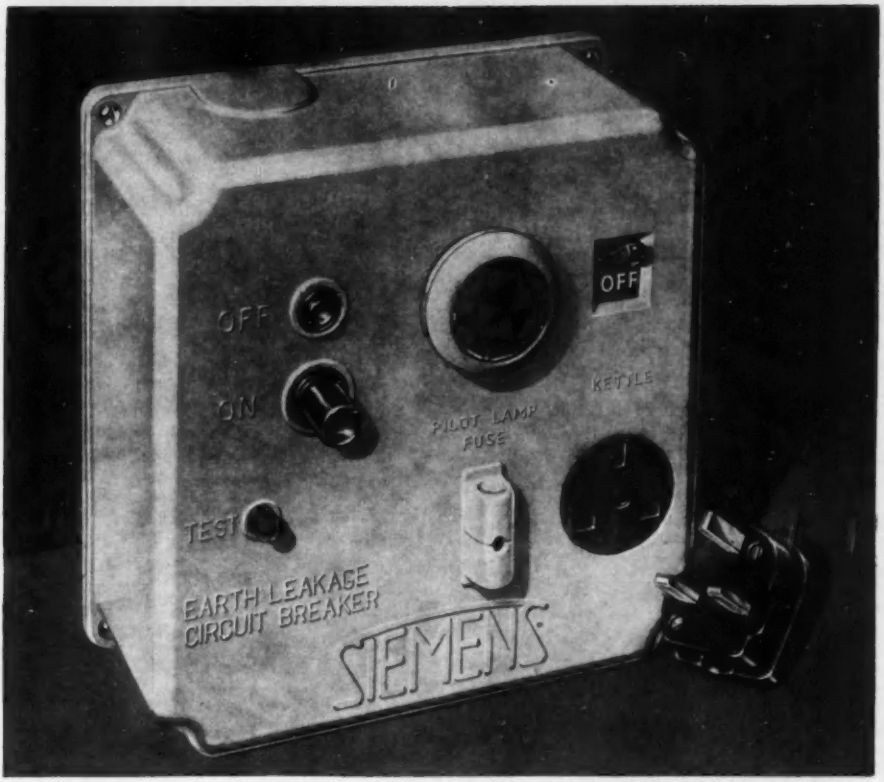
Canadian International Trade Fair

MAY 29 — JUNE 9, 1950 TORONTO, CANADA

DEDICATED TO THE PROMOTION OF INTERNATIONAL TRADE BY THE GOVERNMENT OF CANADA

SIEMENS

EARTH LEAKAGE
COOKER CONTROL UNIT



COMPRISING:

30 amp. D.P. Earth Leakage Main Switch with push button control, test key and meter type terminal block, our P.B. 30D.

13 amp. Kettle socket and fused plug to B.S.S. 1363, 1947.

15 amp. D.P. Short Break Switch controlling Kettle Circuit.

Pilot lamp with ruby lens.

5 amp. Domestic Type H.R.C. fuse protecting pilot lamp.

All protected by handsome cream coloured moulded cover with knockout top and bottom for cable entry.

SPECIAL FEATURES:

All internal non-current carrying metal parts including the sub-circuit components, are earthed through the trip coil of the Earth Leakage Circuit Breaker thus giving complete protection to the sub-circuit, as well as the Main Cooker Circuit. All internal connections are included and easy access to external connections is provided. A moulded rubber grummet is supplied with each unit to fit into whichever of the knockouts is the most convenient to use. Indicator lamp can be renewed when necessary without removing the moulded cover.

Dimensions: 7¾" x 7¾" x 4½" (over plug top)

A Neat, Substantial and Convenient Unit—easy to install and of pleasing appearance

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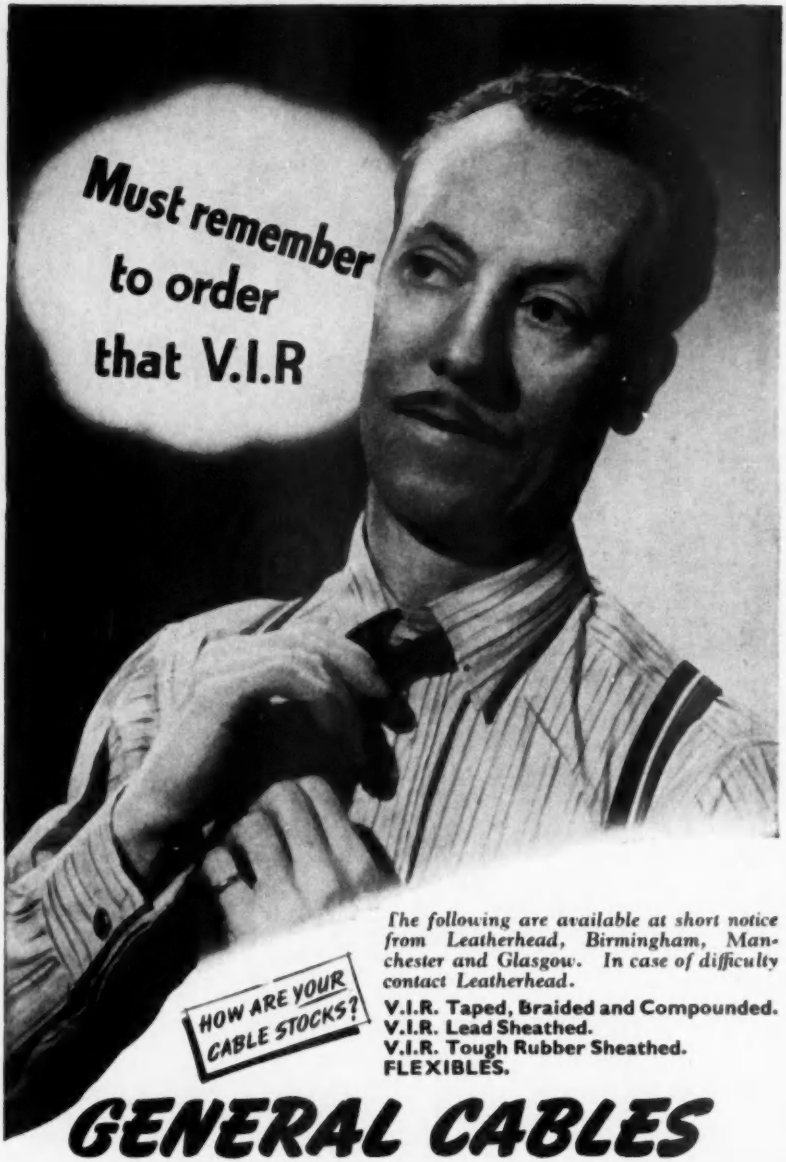

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54a, Newton Street, Manchester. 55/63, Washington Street, Glasgow, C.2

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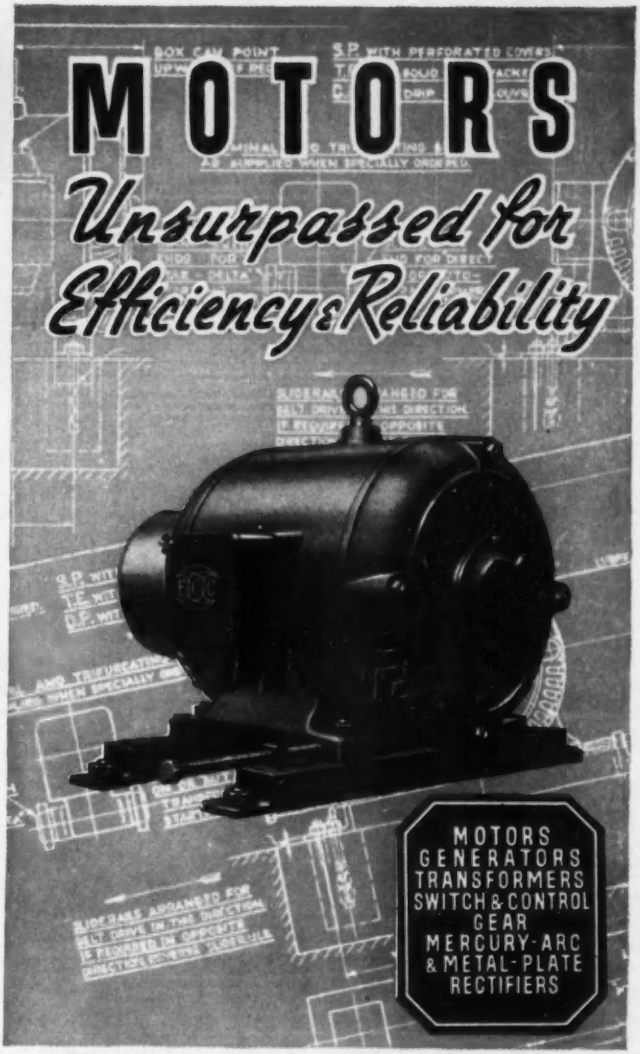

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For Main Cables up to ·15 sq. in with Fuses up to 60 Amperes.

Changes in machine shop layout are greatly simplified by using BICC Detachable Fused Tee Boxes. They offer a system for installing feed points along a cable run which is *easily adaptable*, simple, safe and economical. The assembly is in two parts: Top Cable Chamber and Detachable Fuse Box. The Cable Chamber is available in various forms for jointing, cutting-in or for erection at the same time as the main conduit run. Sizes vary for different cable systems.

The Detachable Triple-Pole Fuse Box beneath (containing three cartridge-type fuse-links) is designed for attachment to any form of top cable chamber and may subsequently be removed for use elsewhere.

Fewer sub-distribution boards, with associated cable runs, are needed when BICC Detachable Fused Tee Boxes are used. Please write for further details.

B.I. Callender's

DETACHABLE FUSED TEE BOXES

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For use on a **TABLE** or with a **SPECIAL STAND**

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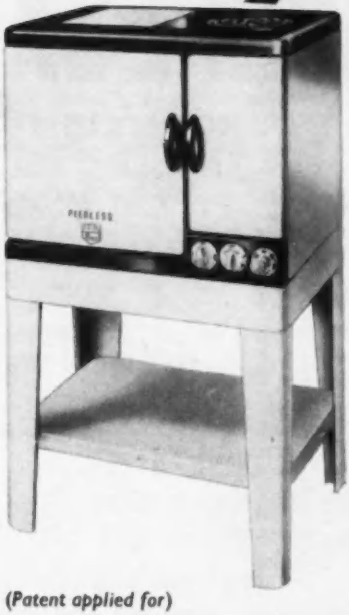
Here is the

'PEERLESS'

ELECTRIC COOKER



'BIG COOKER' capacity — 'SMALL COOKER' consumption

A table cooker of unique qualities, providing the facilities of a full-sized model, but so designed to allow for connection to the electric supply by means of a standard 13 or 15 amp. plug.

Equipment comprises a grillboiler with 3-heat switch and a boiling plate with "Simmerstat" control, while the oven is thermostatically controlled by a "Revostat." The cooker is finished in black and cream enamel and may be supplied with or without stand.

(Patent applied for)

REVO ELECTRIC CO. LTD., TIPTON, STAFFS

HAVE YOU A WIRING PROBLEM?

PERHAPS THE

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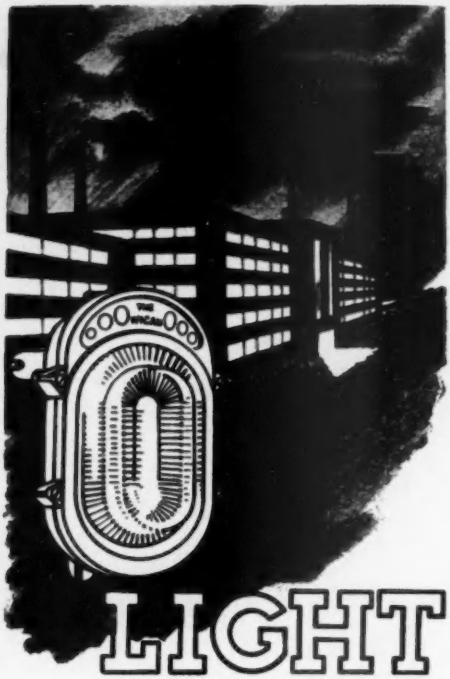

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"The process of withdrawal of the pattern equipment from a sand mould by either manual or mechanical methods. The advantage of mechanical withdrawal is standardisation over a run and the minimum interference with defined limits."

The range of Renfrew's moulding machines offers capacity for the rapid production of sand castings where large quantities demand consistent accuracy within established tolerances. Where required, the floor moulding department offers equal facilities in maintaining customers' standards.

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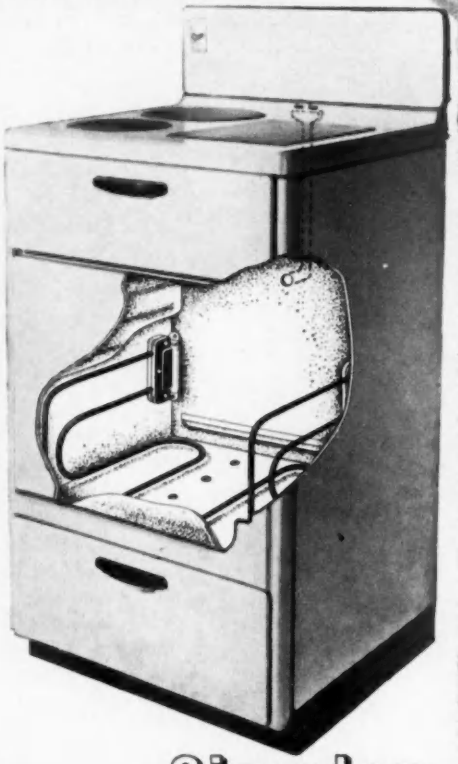
ELECTRIC COOKERS

Patent oven ventilation

Fresh air is drawn in through ducts in oven base under the floor of the cooking space. This cold air is pre-heated in its passage over the oven elements and then travels up the side ducts where it mixes with the hot air circulating in the oven, resulting in overall even oven temperature —there are no cold or hot spots. Steam and cooking fumes are drawn off by a vent pipe near the oven top and are discharged on to the place that is easiest to clean—the front of the vitreous enamelled splash plate



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a great many
applications

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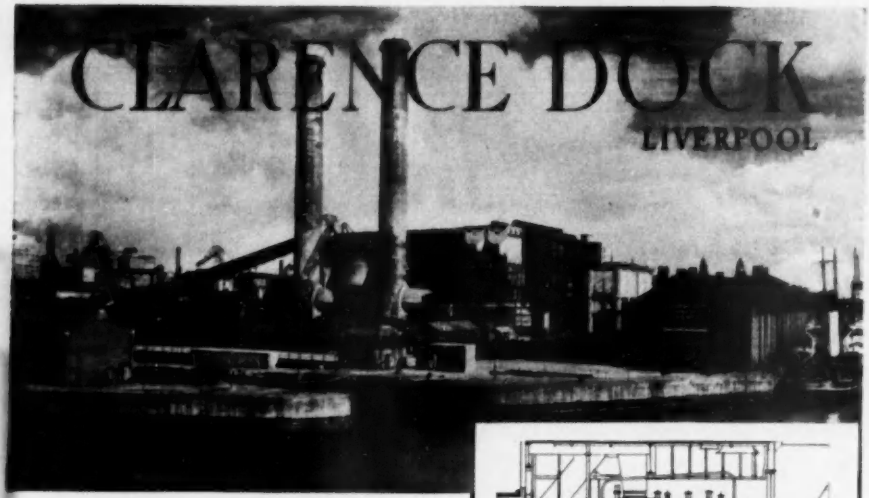
The mark that means that *"little more" in quality*



PROGRESSIVE DESIGN

No. 1 Boilerhouse.

1929 4 B. & W. Type C.T.M. Boilers each for maximum continuous rating of 160,000 lb. steam per hour at 450 p.s.i and 730°F. 2 B. & W. Style 28 stokers 29′ × 22′. 2 of other make.

1935 4 B. & W. Type C.T.M. Boilers, MCR of 200,000 lb. steam per hour at 450 p.s.i and 730° F. B. & W. Style 28 Stokers 29′ × 22′.

No. 2 Boilerhouse.

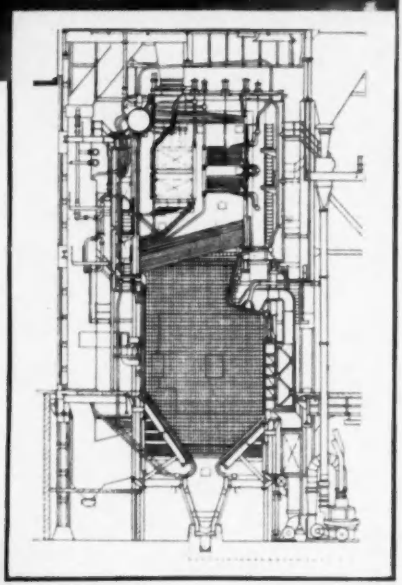
1936 6 B. & W. Type C.T.M. Boilers, MCR of 200,000 lb. steam per hour at 630 p.s.i., and 825°F. B. & W. Style 28 Stokers 29′ × 22′.

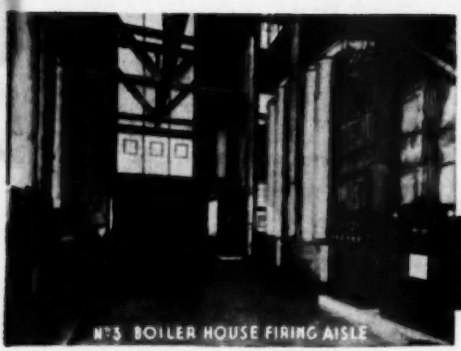
1941 1 B. & W. High Head Boiler, MCR of 250,000 lb. steam per hour at 630 p.s.i. and 825°F. B. & W. Style 28 Stoker, 30′ × 24′.

No. 3. Boilerhouse.

1942 2 B. & W. High Head Boilers, MCR of 350,000 lb. steam per hour at 630 p.s.i and 825°F. Pulverised Fuel fired with B. & W. Type 'E' Mills.

1948 2 B. & W. High Head Boilers, MCR of 350,000 lb. steam per hour at 630 p.s.i. and 825°F. P.F. fired with B. & W. Type 'E' Mills.





ALL THESE BOILERS ARE EQUIPPED WITH FURNACES OF BAILEY WATER-COOLED CONSTRUCTION, THE PULVERISED FUEL FIRED BOILERS HAVING HOPPER BOTTOM ASH DISCHARGE

BABCOCK & WILCOX LTD
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For your new Transformer

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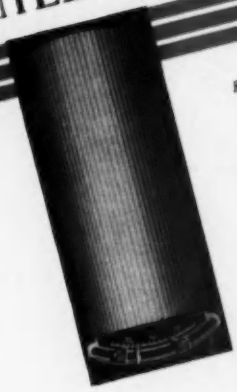
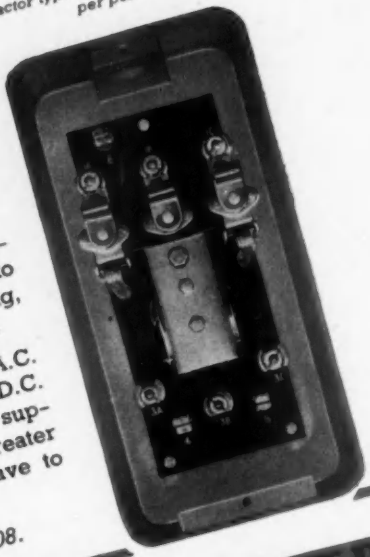
"Satchwell"

FOR ALL CONTROL SCHEMES



Room thermostat type "Q" capacity 15 amps A.C.



Interior view, Triple-pole Contactor type R.A.3 rated 30 amps per pole.

The "SATCHWELL" room thermostat type "Q" is particularly suited to the control of electric Space Heating, to provide comfort and economy.

Single, double and triple-pole A.C. Contactors type "RA" and D.C. Contactors type "RD" can be supplied for use where loads greater than the thermostat rating have to be switched.

Send for lists 100 and 108.

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EVEN SPOOLING
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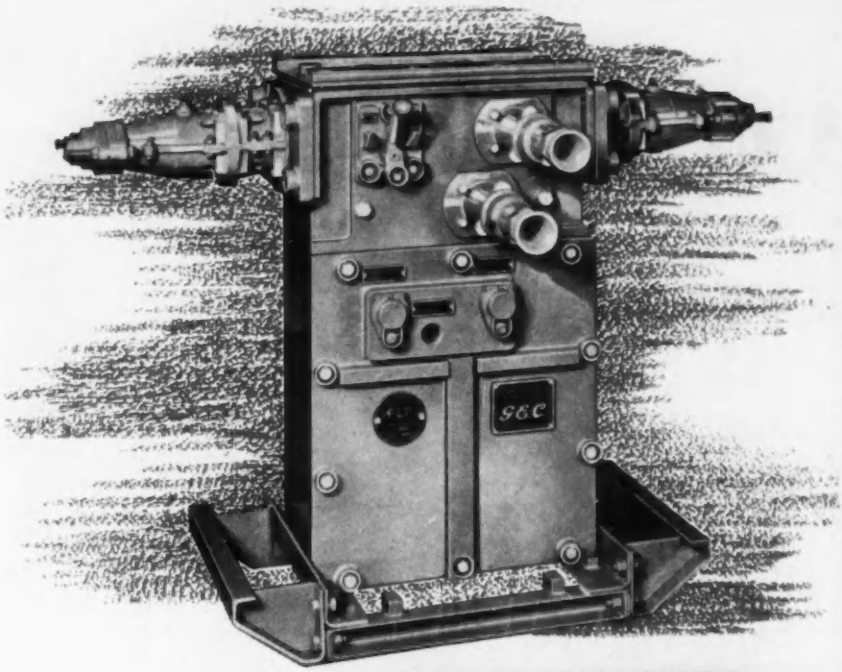

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by

G.E.C.

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★ Suitable for operation from 440, 500, 550 or 600 volt supplies.

★ Equipment mounted on removable chassis to facilitate maintenance.

★ Can be coupled to G.E.C. Automatic Gate-End Switchgear, Type F.M.U., to form combined lighting and power switchgear.

Full particulars are given in Technical Description No. 386.

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The Distinctive Vibration Proof

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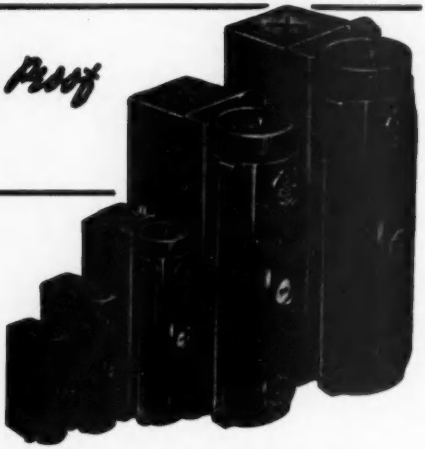

for all Industrial and Domestic purposes from 5 amp. to 100 amp. 250/500 volt conditions of service, readily re-wireable or with high duty cartridges. Highly adaptable for every conceivable method of mounting and connecting, and proof against consistent vibration or severe concussion.

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Patentees & Manufacturers
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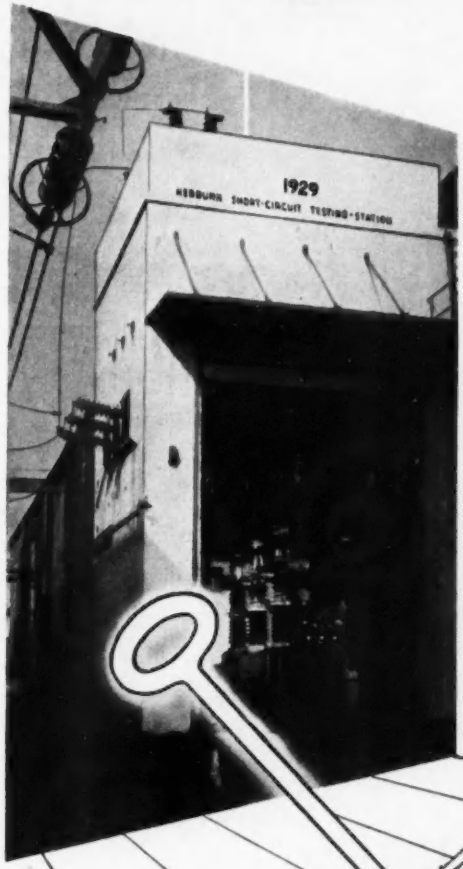
Coming-of-age



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THE SEA

is our natural heritage. Everywhere that tides ebb and flow, British ships sail with British goods — and the British way of life. This photograph by J. Dixon Scott shows a typical scene on London's river— with Thames sailing barge, tug and mighty ocean going liners.

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RESTORE HIS CONFIDENCE, prove to him that Britain still makes the best, show him what 'staying power' really means —and sell him ATLAS. Because of our widespread publicity, and the widespread recommendations of satisfied users, the demand for ATLAS Lamps grows apace—a demand which brings goodwill, and good profits on the terms we offer. Write for particulars, and order now for stock.

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We stopped this customer losing his bearings . . . A customer came to us some time ago complaining that the white metal bearings supporting the main rollers of his wire drawing mill were having to be replaced at intervals of a few weeks. Furthermore, he assured us that fabric bearings showed only a slightly improved result. On our advice, he fitted the mill with 'ASHLAM' F.M. Graphited Bearings. That was over a year ago and regular inspections have shown no wear to date. Our patience exhausted we have decided to make this good news public property at once.

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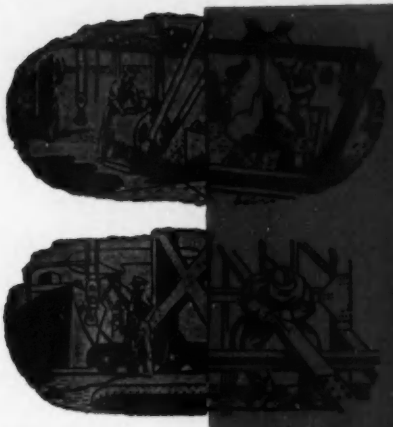

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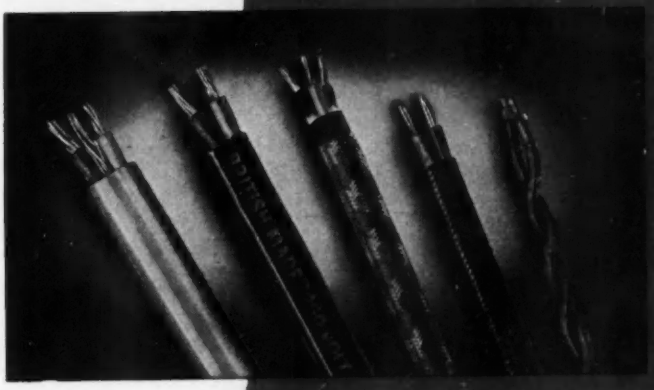

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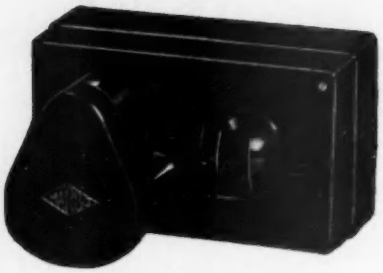

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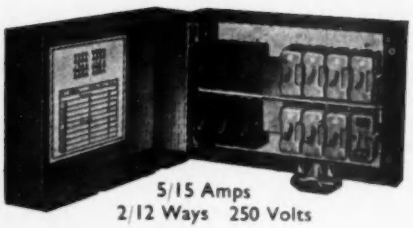

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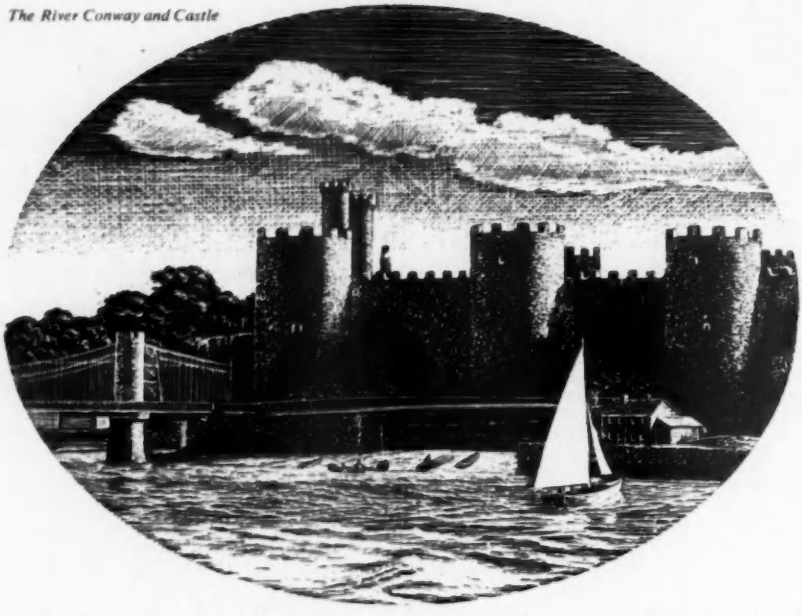

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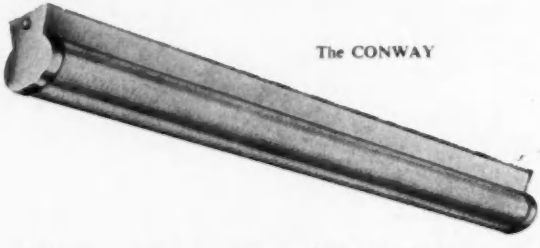

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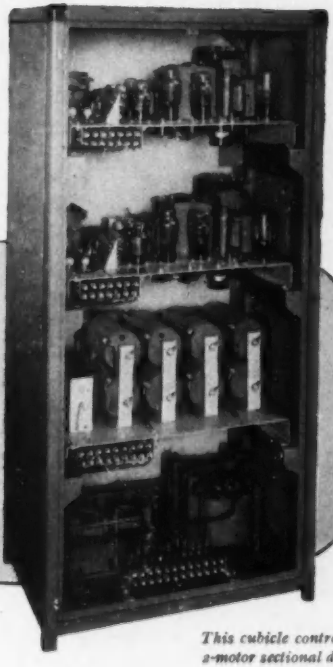

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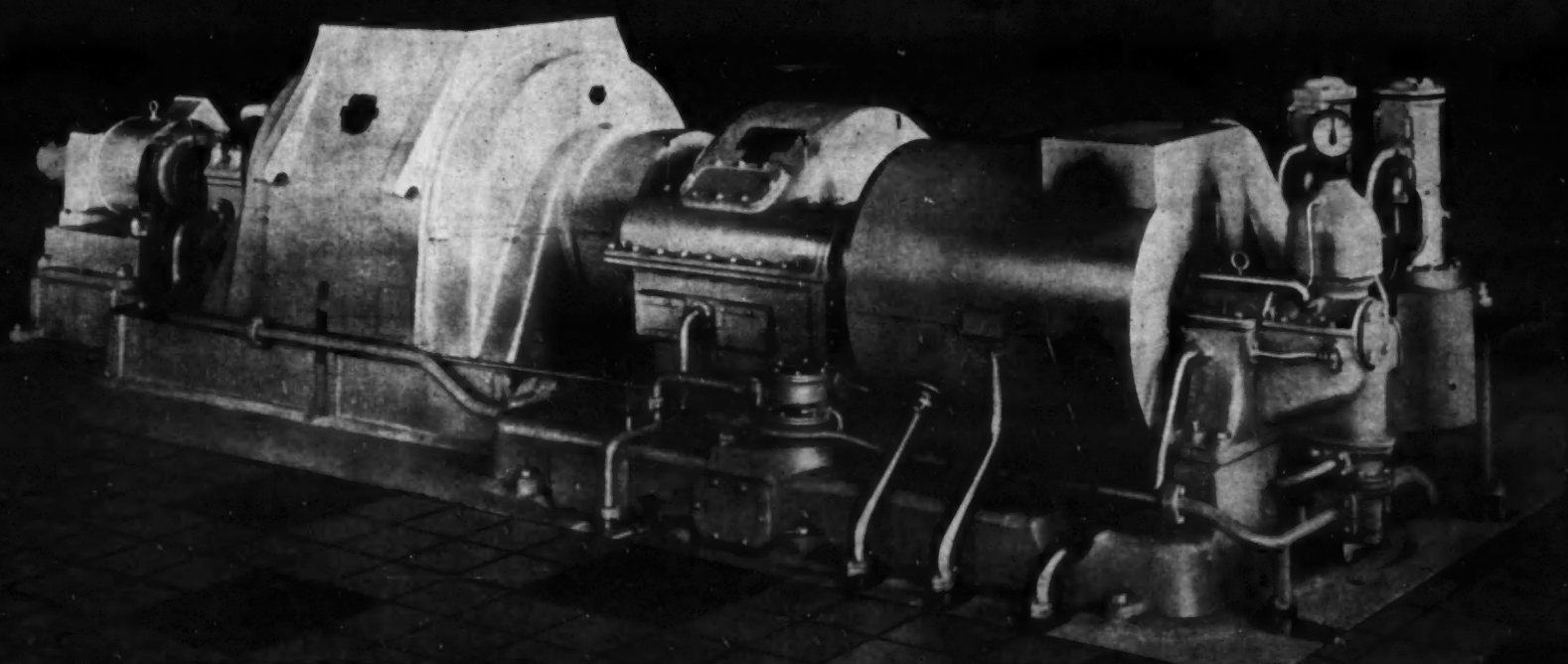

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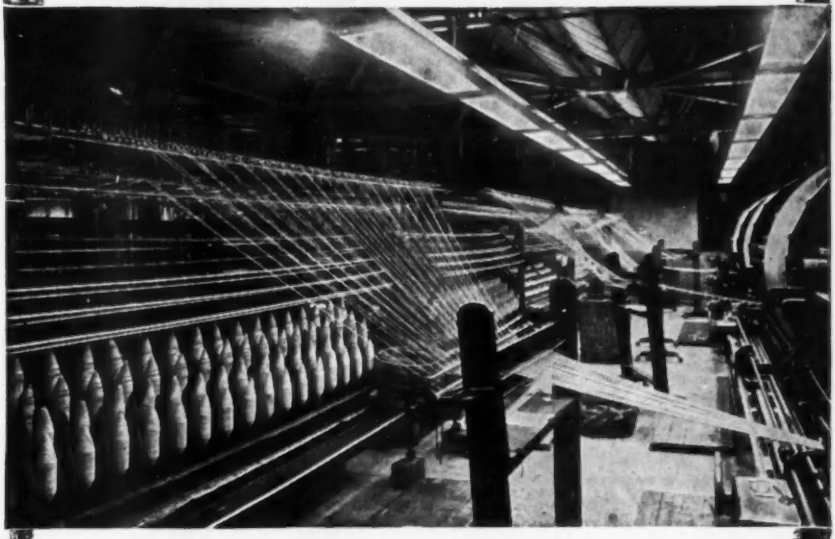

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ELECTRICAL TIMES

FIFTY-NINTH YEAR OF PUBLICATION

Volume 117 No. 3046 THURSDAY, 23 MARCH 1950

PUBLISHED EVERY THURSDAY

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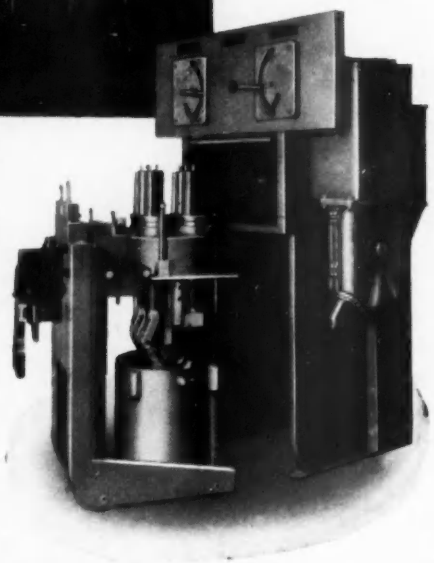

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Editorial

WHAT IS PLANT CAPACITY?

THE lack of a direct and simple means of progress in assessing new plant capacity is unusually well illustrated in the figures published for the past three months. The block graph we publish each month is based on installed capacity and is the sum of ratings of alternators commissioned. Unless there has been a corresponding increase in boiler capacity, however, the machines can have no immediate effect on overcoming the plant shortage. Thus, in December, the installed capacity rose by the record figure of 308 MW, but the increase in output capacity was far from this figure. In February, the reverse effect is seen at work. There was no new generating capacity installed, indeed there was a slight loss, but owing to an addition in boiler capacity the output capacity figure rose. It is for such reasons that we always add a cautionary note in presenting figures of installed plant. Such discrepancies as those we have pointed out may be reduced as the boiler and plant programmes fall closer into step; nevertheless, the increasing tempo of development will greatly add to the difficulty. Not everyone realises that the B.E.A.'s programme provides for the commissioning of new power stations at an average rate of one a month over the next three years, quite apart from extensions to existing stations.

WE MUST LOOK AHEAD

AS any industry grows older, it tends to become quiescent. Tradition, so important when applied to human behaviour, begins to dictate procedure, and precedent to take the place of initiative. In private enterprise, however, the stress of competition provides to some extent an antidote—or rather a counter irritant. No such incentive exists where nationalised industries, or even those maintaining a virtual monopoly, are concerned. This can, to a certain extent, be discerned in the papers being delivered at the Convention on Electric Railway Traction this week, where the tendency seems to be to dwell lovingly on the past, to describe briefly the present and to avoid any mention of the future. Although this amply fulfils the object of the Convention, which is "to present the latest views and practices in Electric Railway Traction and to reveal the achievements and capabilities of British engineers and the British electrical industry in the fields of railway electrification and diesel-electric traction," it does little to indicate the potentialities of British industry in these fields. The future is on the drawing board, and if Britain is to obtain her fair share of overseas contracts it is the future we must contemplate, and not the past, however glorious it may appear.

NO PART FOR THE PRESS

ONE of the principal themes of the I.E.E. discussion last week on Advanced Studies was the difficulty engineers have in keeping abreast of new technical knowledge outside their immediate sphere of interest. This is no new problem, but it is one which is becoming more difficult in view of the increasing tempo of modern research and technical experience. Dr. P. Dunsheath particularly stresses the indigestibility of the transactions of learned societies for this purpose, and the tardiness of textbooks. It is surprising and, we must confess, not a little disappointing, that throughout the discussion the part played by the technical press in meeting these requirements was ignored. It has long been its function to fill just this need and to provide in readily assimilable form the latest technical developments of the industry it serves. *Meteor* is particularly surprised at this omission for, in his student days, he was adjured by his tutor regularly to read the technical journals, a habit which he shares with many thousands of engineers.

A NEW LAMP SEAL

DEVELOPMENTS in discharge lamps are so rapid nowadays, and new lamps with specialised performances and applications follow one another with such rapidity that there is a tendency only to remember those which apply to one's particular sphere of interest. The lamp described in our article on page 447 has a specialised application in high-speed photography, but it has a feature of outstanding general interest in the method of sealing adopted. In place of the multi-foil seal which has hitherto held first place in this type of lamp, it utilises the so-called "housekeeper" seal, consisting of a molybdenum thimble or cup, sealed into the quartz, the actual current being carried by a rod through the centre. While considerable success has attended the foil seal, and it is not likely to be immediately superseded, the new type possesses many advantages particularly with the higher current ratings, and is expected to have far-reaching effects on the future development of high-power discharge lamps of other types.

WELDING BY BATTERY

SPOT WELDING by the use of storage batteries, as described in our article on page 459, offers considerable possibilities in the reduction of the heavy peak currents normally associated with this process. In this imperfect world, most technical advances have to be paid for by sacrifices in other directions, and the chief drawback to this system would appear to be a reduction in flexibility. Even the fastest pneumatic contactor cannot hope to compete in operating speed with the ignitrons used in conventional a.c. timing systems, and it would be impossible to adapt this type of machine to the elaborate "programme" or "woodpecker" welding cycles, necessary for many types of work, where "on" and "off" times are measured in terms of fractions of a cycle rather than fractions of seconds. The necessity for a large battery adjacent to the machine, is an additional complication. On the other hand, the possibility of exchanging heavy single-phase peaks for a moderate balanced three-phase loading is too attractive to be summarily dismissed.

CLOW CONSCIENCE

THE B.E.A. is showing a praiseworthy resolve to implement its promise not to make a profit out of the Clow surcharge, and area boards are now announcing to consumers additional rebates for the spring quarter, designed to dissipate the £3.75 million surplus from this source. We wonder whether they are right? The Clow surcharge was one big blunder; indeed, it was more than one, for not only was it bad psychology but, from the beginning, the rates chosen were obviously wide of the mark. With this unfortunate background, it is doubtful whether the goodwill created by the refund will greatly exceed the effects of reminding consumers of the surcharge. Further, the actuarial necessity for allowing widely differing rebates in different areas may itself give rise to further dissatisfaction. Could not the B.E.A. have been content to forgo the letter of its word and salve its conscience by finding some other method of disposing of this £3.75 million of embarrassment within the ambit of its promise?

WE REGRET—

TO those readers who recently may have been receiving their copies of the ELECTRICAL TIMES later than the usual publishing day, we express our regrets and assure them that we are doing everything possible to maintain deliveries on time. Since the beginning of March, paper has been freed from control, and this has resulted in an upward surge in the demand for printing; our own paper, for example, has considerably increased its size and circulation since the beginning of the month. This larger output has to be maintained despite a severe shortage of skilled printers, and a lack of printing plant no less acute than that of generating capacity in our own industry. Under these conditions we ask our readers to look with a kindly eye on such unavoidable delays, and we sincerely hope that after Easter we shall be able to achieve once more our normal conditions of delivery.

Meteor

A Compact-source Lamp for High-speed Cinephotography

By E. J. G. BEESON

ONE method of studying high-speed phenomena or motion is to take a series of photographs at a high rate and observe these at reduced speed to obtain an apparent reduction in motion. Cinephotography is conventionally termed high-speed cinephotography when pictures are taken at rates exceeding 250 per second and today cameras are commercially available operating up to 3,000 or more frames per second.

It will be realised that camera operation at these speeds presents special lighting problems when compared with those for normal cinephotography at 24 frames per second. The total exposure time for about 4,000 frames seldom exceeds three seconds, and it is necessary therefore to consider new methods of obtaining the very high light intensities demanded by such short exposure times.

The high pressure mercury vapour compact-source lamp is capable of withstanding severe overloads for short periods of time and use has been made of this characteristic in the design of a lamp which is already proving to be an ideal light source for high-speed cinephotography[1,2,3].

This lamp operates at a normal rating of 1,000 watts and it is designed to carry heavy pulses of current to give a lamp power of 10,000 watts for a period of 1 second. A lamp of this type is shown in Fig. 2 and is compared with a lamp having a normal continuous loading of 10,000 watts. The lamp consists of a spherical fused silica envelope into which are fused two seal members carrying the electrodes. The electrode tips are spaced about 8 millimetres apart and between these a compact arc operates. The overload capacity of the lamp is largely dependent upon the anode loading and the watts loading per centimetre in the arc column. The fused silica envelope has not so far proved to be the limiting factor. The lamp contains a limited quantity of mercury and cadmium metal as well as a low-pressure filling of one of the rare gases, such as argon, to facilitate the starting of a glow discharge which builds up to an arc discharge between the electrodes. The energy generated by this arc discharge heats up the lamp until a mercury vapour pressure of about 15 atmospheres is reached.

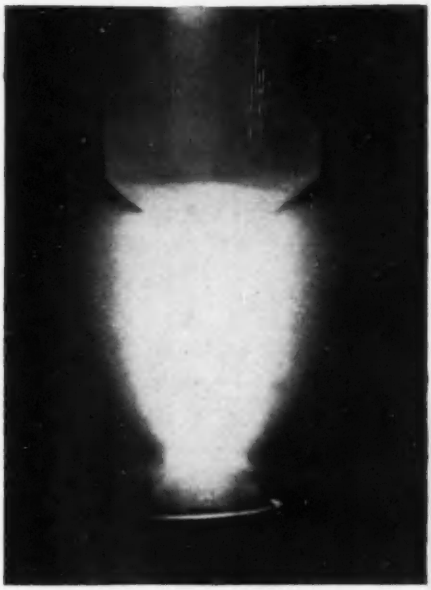


Fig. 1.— Arc source of 1-10 kW type MEC/D lamp operating at 1,000 watts. (Magnification about ×4)

Sealing

The seal members through which current is carried to the electrodes also form the hermetic seal of the lamp. These seals are made by fusing into the silica thin strips of molybdenum foil, and not many years ago the maximum thickness that could be used to make an air-tight seal was only 0·0006 in. Much research and development has made possible the carrying of heavier currents with foils having a thickness of 0·0025 in. Most of these foil seals operate at current densities of about 10,000 amps/sq. in. Recently a new type of seal * has

*To be described in a subsequent article.

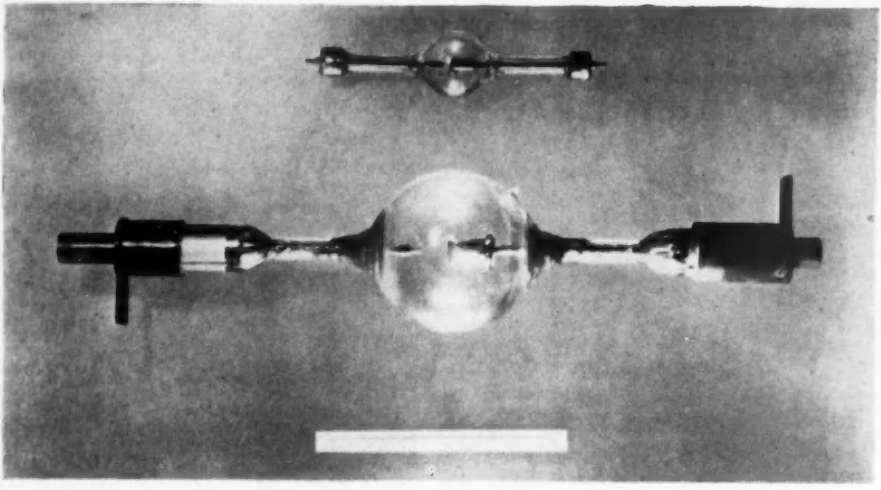


Fig. 2—1-10 kW Type MEC/D lamp (upper) and 10 kW Type MEC/D lamp (lower) showing cup type seal on the upper lamp and multi-foil seals on the lower. The length of scale shown is 6 in.

been developed in which a pressed molybdenum cup, suitably shaped, forms the hermetic seal and through the centre of this cup, and welded to it, is passed a solid rod of metal. This means that currents of many hundreds or thousands of amps may be passed which hitherto have not been readily practical. A cup type seal is shown on a 1-10 kW type MEC lamp in Fig. 2 (upper). This seal will carry a current equivalent to the foil seal as used on the 10 kW lamp shown in Fig. 2 (lower). The ends of the seals, remote from the electrodes, terminate in special caps for leading in the current and to provide a means of supporting the lamp. The lamp is prefocused to ensure correct alignment of the small high brightness source when used in an optical system.

When a compact source lamp is operated from an alternating current supply the light output varies, following the current waveform, and this fluctuation would, of course, produce a variation in exposure in different parts of the film when exposing it at high speed. For this reason the lamp is designed for direct current operation. Due to the negative arc characteristic, a series ballast resistance is required and the control gear for operating the lamp has a tapped resistance, flashing contactor, timing circuit and selector switch. The ballast resistance is arranged to operate the lamp at its normal rating of 1,000 W; the lamp then consumes 15 amps with an arc voltage between 60 and 75 V at an efficiency of 50 lumens/W.

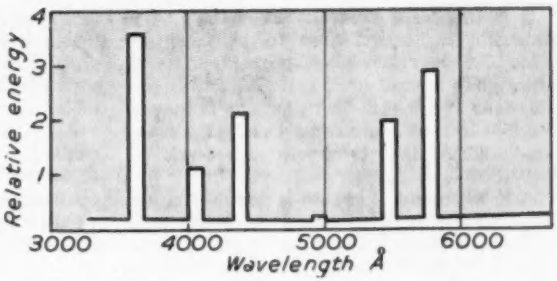
In Fig. 1 is shown the small high brightness source when operating at 1,000 W. The anode is a solid rod of pure tungsten while the cathode, the smaller of the two electrodes, is of thoriated tungsten. When the lamp is subjected to a flash cycle a contactor is arranged to reduce the value of the ballast resistance thereby increasing the lamp power when the timer circuit is actuated and this in turn opens the contactor after a predetermined period. A selector switch provides a range of lamp powers of 3 kW-5 kW and 10 kW with flash durations of 3, 2 and 1 seconds respectively; in this way some control is afforded to the user in the light intensity that he desires for the taking of a high-speed film. In a standard equipment[4] two lamps are operated in series with one another so that for the same current consumed one obtains twice the lamp power to give double the light output. Where an a.c. supply is the only source of power available a rectifier must be used.

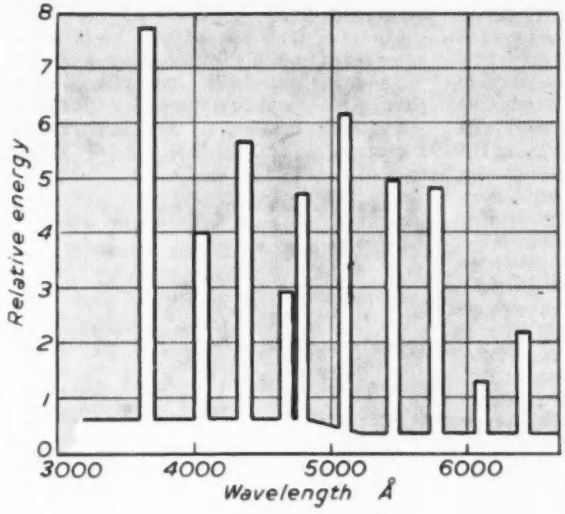
The lamp is mounted in a deep parabolic aluminium reflector and an illumination exceeding 100,000 foot candles can be obtained over an area 12 in. square at a working distance of 4 ft, with 10,000 W in the flash. This may be compared with the illumination from direct sunlight on a clear summer day when the average value is about 10,000 foot candles.

Spectral Distribution

The light radiation given by the compact source lamp is a line spectrum with some

continuum. Most of its energy is radiated in the long-wave ultra-violet and short-wave visible region of the spectrum and it is therefore particularly effective for photographic emulsions. Fast panchromatic film is normally used and with an illumination of 10,000 foot candles a well-exposed film is obtained when working at an aperture of f. 2·8 and at a picture rate of 3,000 per second.





radiation is increased from about 4% to 7-8% by the cadmium metal and during the flash period the continuum is also increased due to the higher current density in the arc. The curve showing this increase in continuum when the 1-10 kW lamp is flashed at 10kW is shown in Fig. 5.

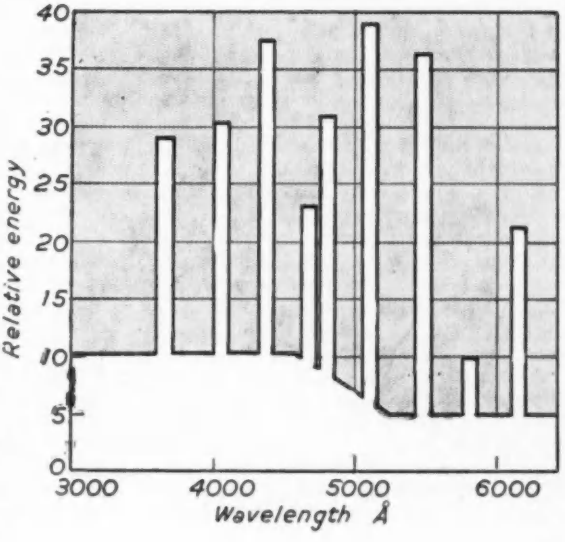
Fig. 3.—(Above) Energy distribution curve for 5 kW compact-source lamp containing mercury only

Fig. 4.—(on left) Energy distribution curve for 1-10 kW MEC/D lamp containing cadmium, operating at 1,000 W

Fig. 5.—(Below) Energy distribution curve for 1-10 kW MEC/D lamp containing cadmium, when being flashed at 10 kW

This means that with the higher light intensities with the mercury lamp the lens may be stopped down to give a greater depth of focus.

It has already been mentioned that the lamp contains cadmium metal, as well as mercury. The introduction of cadmium gives much improved colour rendering by adding to the mercury line radiation additional blue-green lines and a strong red line at 6438Å. A typical energy distribution curve for a 5 kW compact source lamp containing mercury only is given in Fig. 3 and that of the 1-10 kW lamp operating at 1,000 W in Fig. 4 which contains a mercury cadmium mixture. The improvement in the red content of the light



It is this feature which has enabled very successful high-speed films to be taken in colour. Colour film has a much lower speed rating than monochrome material, and it has also been found that the reciprocity failure of the film falls off more rapidly at high speeds, which means that extremely high levels of illumination are therefore required.

A further point of interest is that the heating effect by the light irradiating an object may become a serious factor when very high levels of illumination are used. Here the mercury lamp shows an advantage over sources like the incandescent lamp which have hitherto been used. Tests made on the human skin show that at least 4 times the illumination may be used as compared with tungsten lighting for the same temperature rise. Conversely the heating effect on an object will be lower with a mercury lamp for the same illumination, but there will be some difference depending upon the absorption of the object. Furthermore, with the mercury lamp the full light intensity is only maintained for a minimum of time, i.e. from 1-3 seconds during the exposure of the film.

The average life of the lamp at its nominal rating of 1,000 W is about 500 hours, but its life is largely determined by the number of flashes and the power in the flash. As we are mainly interested in the maximum light output possible in this type of application, it is possible that 500 flashes may prove to be acceptable.

Apart from the economical and simple method of obtaining these very high-light intensities, the "modelling" light when the lamp is operating steadily at 1,000 W, the short period of flash, high efficiency, good colour rendering, and relatively low heat radiation of the mercury lamp means that a greater depth of focus is possible with films taken in monochrome and very good results are obtained when using colour film. This method may be of importance apart from high-speed cinephotography.

I should like to thank my colleagues who have helped to obtain this data and to acknowledge the permission of Mr. L. J. Davies, Director of Research, B.T.H. Co. Ltd., Rugby, to publish this paper.

1 Beeson, E. J. G. A High Intensity Light Source for High Speed Cinematography. *Nature*, vol. 164, p. 453. Sept. 10, 1949.
2 S.M.P.E. High Speed Photography Symposium. March, 1949.
3 Beeson, E. J. G. A High Intensity Light Source for High Speed Kinematography. *The Photographic Journal*, vol. 89B. May-June, 1949.
4 Bourne, H. K. Cine Flash Equipment for High Speed Cinephotography. *Functional Photography*, vol. 1, No. 4. Jan., 1950.

Area Boards Co-operate in Fair Trading

AREA Boards are collaborating with the Electrical Fair Trading Council and a friendly discussion has already taken place, disclosed Mr. V. Watlington, chairman of the Council, on Friday. Presenting the annual report, Mr. Watlington said that at the first meeting between the Boards and Council the B.E.A. claimed the functions of Boards were in excess of those of contractors/retailers and that consequently they were entitled to special status recognition for discount. Consideration of the functions referred to is now taking place and the Council will present a report at a further joint meeting.

"Through their respective associations, the E.C.A. of S. and N.E.C.T.A. Ltd., in separate negotiations with the Area Boards, have happily agreed upon some principles to guide the future trading relations of all electrical contractors including Boards."

A claim to more favourable terms than those at present accorded to them as "special large buyers" has also been received from the English and Scottish Co-operative Wholesale Societies.

Acknowledgment in the fair trading policy of a discount for commercial and industrial organisations and the effect on list prices was receiving close attention of the manufacturers. Member - Associations who recognise the "special large buyer" had received from the Council a guidance list to assist in computing their own individual lists. The respective schedules 2, 3 and 4, covering electric light fittings and fittings accessories, may soon show a margin between "trade" and "special large buyer" basic discounts for the first time, and a wider margin between "trade" and "recognised user" basic discounts than before. In some categories of fittings the trade discount may be reduced.

A recommendation for terms to hospitals, institutions and local government authorities has been made as an interim measure to guide industry, continued Mr. Watlington. Qualification for discounts was being based on compliance with the definitions "special large buyer" or "recognised user," provided the appropriate schedule recognises these classes.

Efforts are now being made in Australia, New Zealand and South Africa to inaugurate similar trading codes to our own fair trading policy, revealed Mr. Watlington. Every possible assistance was being given.

Our readers' views . . .

Commercial Engineers

THE N.J.B. Schedule which has now been agreed, places all district consumers' engineers (or commercial engineers) on a lower grading than their opposite numbers, the distribution engineers. This distinction is unjustified and unfair.

During the negotiation of the agreement, distribution engineers were ably represented by the E.P.E.A., but comparatively few consumers' engineers are members of this association and were, therefore, virtually unrepresented.

Quite naturally, the E.P.E.A. pressed the distribution engineers' claim, with the result that Consumers' engineers are to be graded at least one grade (and possibly two) lower than their co-partners with whom they work in double harness.

It should surely be recognised that consumers' and distribution engineers are both *equally* necessary for the efficient working of a supply undertaking.

In many cases, the writer included, the consumers' engineer first qualified on the distribution side and through having a flair for consumer relations and matters commercial, transferred to the consumers' engineer side. He now finds as a result of this dual training that he has been relegated to a junior position, which appears to be a poor reward for the additional experience gained.

That the distribution engineer has a responsible and essential function in the organisation nobody will deny, but surely it is grossly unfair to place the commercial side of the undertaking in a lower grade. The future of the industry (and the distribution engineer) rests on the ability of the consumers' engineers to build up the load with satisfied consumers.

Present restrictions must not be allowed to obscure the fact that the supply industry must develop and expand and this task will fall equally on the shoulders of consumers' and distribution engineers. In all fairness, let the eward be equal.

"Consumers' Engineer"

KENT

Efficient Maintenance

THE Editorial notes in your issue of March 9 are timely and are in line with the policy which my Association has been preaching for many years.

Too few people appreciate the relation of efficient maintenance to present-day production, and that the efficient electrical maintenance engineer is an important production factor. It is a fact that in many establishments maintenance is regarded as non-productive, and, as you state, "many otherwise enlightened managements take a very limited view of the maintenance question," a view borne out by our experience.

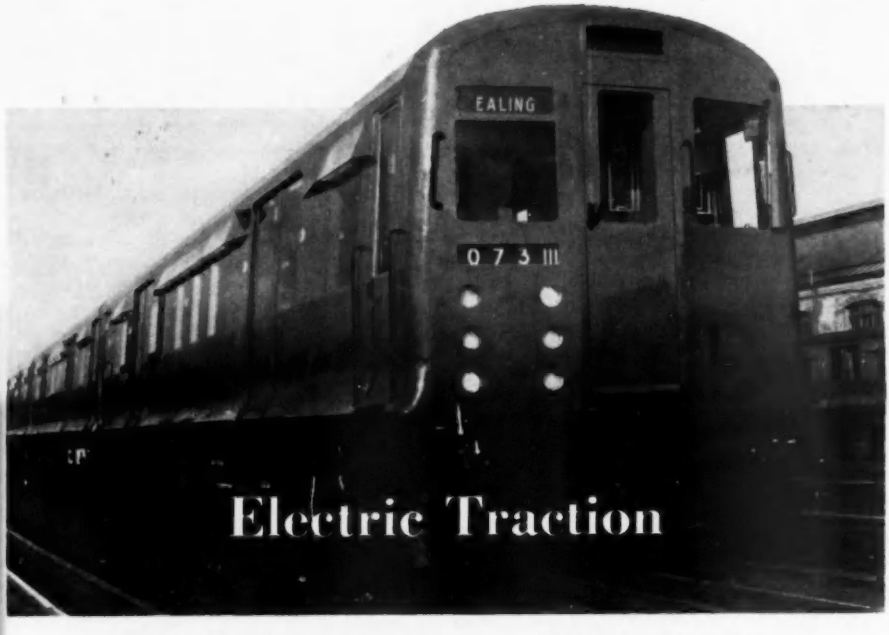
The employment of efficient engineers has been continually advocated by the A.S.E.E. as a good business proposition, and our educational work has been directed towards this end. The case of the 'handy man' in charge of valuable electrical equipment and apparatus is by no means rare.

The lack of proper recognition of the importance of efficient electrical maintenance may, however, be due to lack of appreciation by the non-technical employer of what is involved and of the need for a recognised standard of experience and training which would be a guide to the employers when engaging electrical maintenance engineers and would even set a standard for their present staff. To meet this position the A.S.E.E. introduced its Diploma Scheme in 1945, under which the Swann Diploma is issued to those who pass its oral examination.

The Swann Diploma, which gives a standard of competence, should go far in remedying the position you outline. While it will not convert all those who lack an understanding of what is meant by efficient maintenance, the Diploma Scheme does make a useful contribution to the problem, in that the holder of a Swann Diploma has evidence of passing a practical and technical examination conducted by eminent engineers. The Diploma is therefore of great value to both employers and engineers.

A. Brammer
General Secretary

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.



Electric Traction

I.E.E. Reviews Present-day British Practice

THE use of electricity for railway traction goes back to the beginning of the electrical industry, but it was not until August, 1883, that the first railway to use electric power went into public operation at Brighton. This was Magnus Volks passenger railway which is —in considerably modified form—still running today. The technical developments since that date, in all branches of electrical traction, are now being discussed in a series of papers being read at the I.E.E. Convention on Electric Railway Traction which opened on Monday.

Opening Speeches

Professor E. B. MOULLIN, opening the Convention, welcomed the many visitors from the British Commonwealth and from Europe. He remarked that the conception of the Convention arose in the Institution some four years ago when the Traction Technical Committee thought that there were many aspects of electric railway traction which could with advantage be discussed.

It was a matter of considerable regret that he was unable to remain in London for the remaining sessions of the Convention, but he had to go to South Africa.

Following Professor Moullin's introductory remarks, Sir CYRIL HURCOMB, Chairman of the British Transport Commission, made the opening speech. He thought that the Convention proceedings would interest railway administrations all over the world, and from the point of view of the British Transport Commission they were most opportune as they could not fail to assist in the search for a correct solution to one of the most far-reaching problems of today—what form of motive power we should adopt for the future.

The haphazard electrification of different sections of the railway system had retarded progress, and although it would be necessary to retain the conductor rail in South East England, elsewhere a 1,500 V overhead system would be adopted.

A special body of officers of the Railway Executive was at present considering future policy as regards motive power, and their report was still awaited. Sir Eustace Missenden, last November, in a paper read to the Institute of Transport, came down on the side of electrification. This was, however, a personal view. There was also the question of revenue to be considered as well as maintenance and running costs, and the effect of electrification on road travel was an important point.

Speakng personally, however, Sir Cyril thought it was obvious that the electrification

of South East England should be completed, both for freight and passenger trains. Additional tube lines were necessary in the London area, and the electrification of the London, Tilbury and Southend line was a matter of some urgency. Further afield, the Manchester/Sheffield line might be extended to Liverpool, and the Manchester systems integrated; the same was also true of Liverpool. This might lead to the electrification of Lancashire. Tyneside and Glasgow were also areas of interest. Most of all, though, what he would like to see was the electrification of main lines from London to a point where the traffic density began to fall. There was still no main line electrification in this country in the full sense. We had nothing to show our overseas visitors, yet our manufacturing companies had undertaken very successfully large electrification schemes abroad.

He concluded by expressing thanks to all taking part in the Convention, and expressed his views that we would continue to make some progress toward electrification. He hoped that we should not have to wait too long for a real move forward.

Papers

With the large number of papers being read —some thirty in number—it is, of course, impossible to do full justice to the wealth of information presented in the space at our disposal, and we have therefore abstracted those of unusual interest.

As one would expect, the first paper, by Mr. C. M. Cock, was mainly of historical interest,[1] and covered the general situation in this country as it is at present. On the second day, the more detailed descriptions of systems and of matters requiring consideration were presented. The London Underground system with its requirements for a high degree of reliability was dealt with by Messrs. T. S. Pick and R. Dell,[2] who explained many of the difficulties encountered and the manner in which they had been overcome. It was pointed out that much of the substation plant and high-voltage cable system was over forty years old, and that the long period of reliable and efficient service was a high tribute to the skilful design, robust construction and sound workmanship built into the early equipment. The system had to cope with a traffic density of 40 trains/hour in the rush hours, and at one station—Charing Cross—the number of passengers arriving, departing, or changing platforms amounted to 955,000 per week and was estimated to reach 20,000 per hour during peak periods.

To ensure reliability of supply, the h.t. cables were run in pairs, one in the up and one in the down tunnel, and looped into alternate substations. Most of the generation was at 11 kV 33⅓ c/s, although some 25 c/s existed. New plant, however, would be at 50 c/s. Converting machinery comprised in 1948 197,700 kW of rotary convertors, 117,500 kW of water-cooled pumped rectifiers, 42,500 kW of air-cooled pumpless rectifiers, and 2,000 kW of glass rectifiers. The general operating and maintaining of the track from an electrical viewpoint was discussed at some length.

Overseas

It is not often realised to what extent British engineering has been responsible for overseas electrification. It was not until after the 1914-18 war that the equipment reached a good stage of development, but even so work had been done

Liverpool St. - Shenfield electrification at Bethnal Green Station showing overhead line system

South Region booster electric loco No. 20003

between 1907 and 1914 on the Buenos Aires suburban electrification of the Central Argentine Railway at 800 volts d.c., and also at Melbourne at 1,500 volts d.c. Since then British equipment has been supplied to over 30 countries. Some of the more interesting overseas systems were briefly described by E. T. Hippisley[4], who emphasised that in the majority of cases, special conditions had made the use of electric haulage economically necessary. Although most of the paper dealt with electrification in the conventional sense, he devoted some time to the subject of diesel-electric equipment in the development of which Great Britain tended to lag somewhat behind other countries. An interesting installation of this type was that on the Colombo-Matara line and on the hilly route to Kandy in Ceylon.

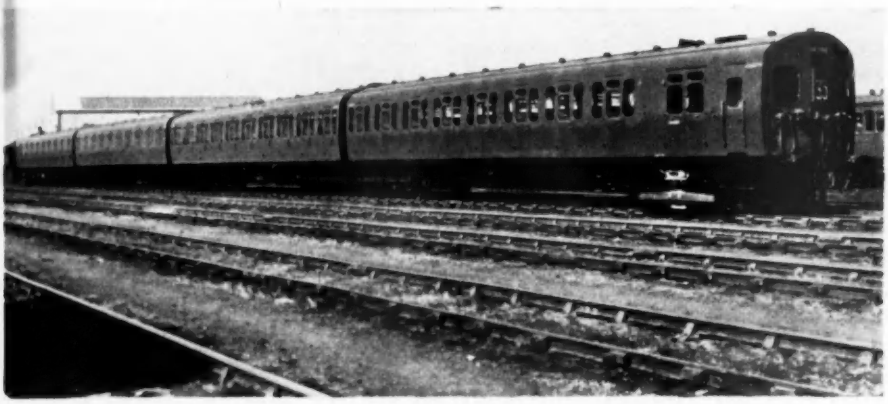
The same day Mr. H. H. Swift[3] dealt with the electrification of the Liverpool Street—Shenfield lines of which a description was published in the ELECTRICAL TIMES of September 29 last year.

Project Considerations

Among the major items which must be carefully investigated in connection with electric traction are such considerations as the effect of electric traction on the track, the spacing of substations, the type of rolling stock to be adopted and tractive resistance. Of these the first is a cause of considerable controversy. Mr. F. C. Johansen[5] tacitly assumed that track deterioration was worse with electric traction than with steam, and thought that the effects were cumulative and were enhanced by maintenance difficulties peculiar to electric lines, but also produced figures which showed that there was less wear on certain electric lines than on steam lines under similar running conditions. Side-cutting, he attributed to severe wheel impacts which could be induced by having excessive clearances in the axle-bearing assemblies and between the rubbing surfaces of bolsters and bogie transoms, combined with too little clearance for the power bogies to move axially relative to the motor-suspension bearings. Careful design could be instrumental in reducing this. Finally he gave a brief statement on costs in which he pointed out that both capital costs and running costs were higher for electric traction.

Spacing of substations is also a source of controversy in which economics and technicalities need to be carefully considered, and the factors affecting this were dealt with by Mr. W. J. Webb[6] who outlined a graphical method of correlating the maximum permissible voltage drop, the overload-current trip setting of the

Modern type surburban multiple-unit rolling stock (Southern Region)



track feeder circuit-breakers, and the sub-station loading.

The relative merits of multiple-unit trains and locomotive-hauled rolling stock formed the basis of Mr. W. S. Graff-Baker's contribution[7]. He did not, however, come to any defined conclusion, leaving the situation somewhat open. The details, however, of the practices adopted by the London Transport Executive, particularly with regard to coupling and uncoupling, and the coach combinations employed, illustrated the tremendous difficulty in reaching a decision as to the best methods to use.

The main line diesel-electrics 10,000-1 leaving Rugby (Midland Region)

Finally, in this group, Mr. F. Lydall had some observations to make on the tractive resistance of electric trains[8]. He dealt mainly with the question of air-resistance, and gave some interesting figures obtained from practical experimentation, both on the track and in wind tunnels. It is strange to note, however, that even in these modern times there still remains much work to be done on the subject, particularly as far as goods trains are concerned.

Equipment

The third day of the Convention, on Wednesday, was devoted to more detailed descriptions of equipment and locomotives. The first paper was by Messrs. F. B. Kitchin and J. Holland, and discussed the problems facing designers of the overhead line equipment[9]. The practical experience of the authors had been mostly with d.c. systems operating at either 3,000 or 1,500 volts, although the fundamental methods they described were generally applicable to a.c. schemes. The first consideration was to determine the copper section required and from then to decide on the best arrangement of conductors. In this country, where overhead electrification was being carried out, a major difficulty arose in fitting the supporting structures into the existing rail lay-out, and many non-standard arrangements had to be adopted which greatly increased the cost of structures and foundations.

As the authors had been particularly concerned with the Liverpool Street-Shenfield scheme it was natural that most of the paper was devoted to a description of the equipment used in that scheme, and the difficulties encountered.

The most difficult problems were in connection with the small clearances at tunnels and bridges and whereas abroad, where bridges were comparatively well spaced, it was often possible to terminate the main catenary wire at the bridge face and jumper the terminated ends by means of an insulated cable, it was uneconomic in this country where there were many bridges close together. The problem then was to get all the bare wires (for Liverpool-Street-Shenfield a main catenary, an auxiliary, and contact wire) through the bridges without cutting them and in the smallest possible space, while preserving the essential flexibility of the contact wire. The paper also gave illustrations of the methods used to overcome these and other problems such as rail bonding and feeder cables.

From the overhead system, to the track was the next move as Messrs. M. E. Constant and C. A. Craig gave their paper on conductor rail installation and maintenance[10]. This contained brief details of the conductor rail systems used for electric traction by the London Transport Executive and British Railways, and then went into detail on the specification, testing and maintenance of the third-rail system on the Southern Region. Details were given of the new standard 106- and 150-lb/yd flat-bottom and 130-lb/yd rectangular conductor rails. The types of collector shoe-gear used by the L.T.E. and the Southern Region were also described.

South Africa

Some of the difficulties associated with railway electrification abroad were mentioned in

New electric locomotive for Manchester-Sheffield scheme viewed at Gorton Works, B.R.

the two next papers which dealt with lightning protection and rectifier substations on the South African electrified railways, presented by W. L. King[11] and A. J. G.Gosling[13] respectively. The paper on lightning was particularly interesting as the area concerned in Natal is extremely prone to heavy lightning storms over a large part of the year. Although the situation was well known and, when the first section was electrified in 1925, such precautions as were then available were taken, considerable damage was done. In one storm alone, 16 locomotives suffered extensively due to failure in arrestor equipment. The main damage was not caused directly by the stroke or surge, but by the follow-up power arc from the 3,000 V d.c. line. The introduction of high-speed circuit-breakers and line sectioning was however instrumental in reducing this trouble. The original horn gap system was also modified but the surges induced by lightning continued to cause main motor armature failures. A simple remedy for this trouble was found by connecting the interpole coils between the armature and the line, and insulating them for over-voltage. This coupled with the introduction of inductive surge absorbers on the roof of the locomotive finally provided the best remedy.

For substation protection, electrolytic arrestors mounted inside the substation on each outgoing feeder, together with one arrestor on the positive busbar, have been found satisfactory.

Mr. Gosling's paper was somewhat more extensive and covered substation practice on the Natal, Cape and Transvaal systems. The future tendency on these systems is toward the mercury arc rectifier using grid control for regeneration as far as Natal is concerned. On the Cape system automatic resistance switching is to be introduced to prevent excessive voltage rise on the d.c. busbar system when regeneration takes place. The majority of equipments will have 4-6 steps, with the first 2 to 4 cut-in by means of ignitrons operated by an electronic apparatus, and the remainder are cut-in by high speed contactors. The resistances must be switched on to the d.c. bars very rapidly before the voltage rises to an excessively high value. To ensure transient stability, however, a delay of one millisec. is introduced between the rise of the d.c. voltage and the firing of the first ignitron, and a further delay of five millisec. between the operation of the successive ignitron steps provides discrimination. Each resistance has a value of 42 ohms and is continuously rated at 83 amp.

On general operating experience, it is pointed out that on the Reef the rectifiers are operating practically trouble-free. In Natal, however, a programme of modernisation is being undertaken, which includes the replacement of water-cooled anodes by the air-cooled type, and various circuit modifications. These steps are being taken to eliminate flashover on the grid-bias generators, and polarity reversals, which have been a source of trouble particularly when the unit is operating as an inverter. The Author concluded by stating that the satisfactory performance of inverters since they were placed in service has established full confidence in their reliability.

Locomotives and Coaches

Electric locomotives are comparatively rarely seen on British Railways as compared with the multiple rolling stock. In fact, only four main groups are being used, although there is one representative example of a fifth group—locomotive No. 6000 of the Eastern and North Eastern Regions, which is now running in Holland. Taking this last, it is a B_0+B_0 mixed traffic locomotive, the forerunner of those which will be used on the Manchester-Sheffield-Wath scheme described in the ELECTRICAL TIMES of 23rd February.

A general description of this locomotive and of the others was given by Mr. W. J. A. Sykes[14] who, however, concentrated principally on the newer types. Among these, probably the most interesting from an electrical viewpoint was the C_0+C_0 mixed traffic locomotive of the Southern Region. This type of locomotive has peculiarly difficult working conditions, as it has to operate on the third rail system where long gaps in the conductor rail continuity are inevitable. In the worst instance, these gaps may extend as much as 600 ft. Apart from the

possibility of the locomotive "stalling" in a gap if held up by signals or checked for any reason, the problem arose of train "surging" due to the sudden cessation of tractive effort when crossing one of the gaps. The last locomotive of this type, completed in 1948, carries several modifications introduced as the result of experience on its two predecessors. The principal feature is, of course, the introduction of two large flywheel booster sets, which, while the locomotive is passing over gaps, automatically is converted into a generator unit.

The first locomotive had several cases of flashover on the booster motor commutators, which were found to be due to short circuits of the conductor rail.

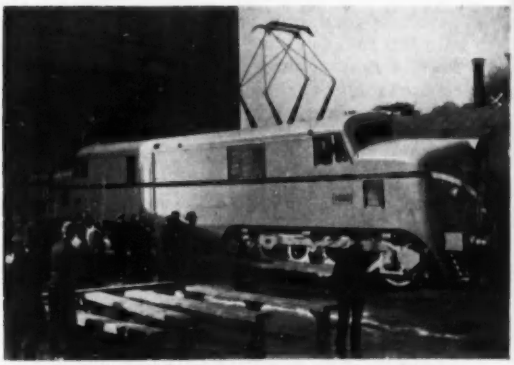
Considerable running had been completed with the first two locomotives when it was found that severe traction-motor flashovers occasionally occurred. This was due to the relative speeds of flux decay between the armatures and fields of the motors which occurred during the incidence of earth faults. Special protective gear was therefore devised to cope with this situation. The paper ended with some comments on the mechanical construction of the locomotive.

Diesel-Electric Locos

Two papers were presented on Wednesday on diesel-electric locomotives. Mr. F. A. Harper[15] dealt with the shunting and main line engines used in this country and Mr. E. S. Cox[16] was more concerned with mechanical design considerations.

The former paper gave an interesting historical account of the development of diesel traction and suggested that a little more co-operation and perseverance in 1928 on the part of a leading electrical manufacturer and the railways, in connection with the overcoming of teething troubles on an experimental 500 h.p. installation, might have placed this country in a leading position. The diesel-electric shunting locomotive was described in some detail, and the electrical requirements analysed.

As far as main line locomotives were concerned, the only two running were the 1,600 h.p. units, Nos. 10,000 and 10,001 of the L.M. Region (see ELECTRICAL TIMES, Dec. 25, 1947.) The technical data were given and a comparison between present-day British and American practice made.



Brazilian wide-gauge loco at Vulcan Foundries

ELECTRIC TRACTION CONVENTION PAPERS

1.	C. M. COCK	Railway Electrification in Great Britain.
2.	T. S. PICK AND R. DELL	Review of British Underground Practice.
3.	H. H. SWIFT	Electrification of the Liverpool St.-Shenfield Lines.
4.	E. T. HIPPISLEY	Achievements of British Engineering Overseas.
5.	F. C. JOHANSEN	The Effect of Electric Traction on the Track.
6.	W. J. WEBB	Spacing of Substations.
7.	W. S. GRAFF-BAKER	Multiple Unit Trains.
8.	F. LYDALL	Tractive Resistance of Electric Trains.
9.	F. B. KITCHIN AND J. HOLLAND	Overhead Equipment Design.
10.	M. E. CONSTANT AND C. A. CRAIG	Conductor Rail Installation and Collector Shoe Gear.
11.	W. L. KING	Lighting Protection on the S.A. Railways.
12.	S. B. WARDER	Traction Substations
13.	A. J. G. GOSLING	The 3,000 V M-Arc Rectifier Substations of S.A. Railways.
14.	W. J. A. SYKES	Electric Locomotives of British Railways.
15.	F. A. HARPER	Diesel-Electric Locomotives of British Railways.
16.	E. S. COX	Mechanical Design of Electric and Diesel-Electric Locos.
17.	F. W. SINCLAIR AND S. C. LYON	Mechanical Design of Light-Weight Motor and Trailer-Coaches.
18.	R. BROOKS	Control and Aux. Equipment for D.C. Electric Locos.
19.	E. T. HIPPISLEY AND F. E. BUTLER	Control Gear and Auxiliaries for D.C. Multiple-Unit Trains.
20.	R. I. D. ARTHURTON	Power-Operated Doors on Multiple-Unit Electric Railway Stock.
21.	H. R. BROADBENT	Electro-Pneumatic Brakes.
22.	J. W. GRIEVE	Electric Coach Lighting and Heating.
23.	P. L. MARDIS AND W. G. JOWETT	Electrical Equipment of Diesel-Electric Locos and Motor-Coach Trains.
24.	F. WHYMAN	Railway Electric Braking Systems.
25.	G. H. FLETCHER AND E. A. BINNEY	Modern Traction Motors and Gearing.
26.	DAVID MCKENNA	Running Attention to Electric Rolling Stock.
27.	H. H. C. BARTON	Maintenance of Electric Rolling Stock
28.	F. A. HARPER	Maintenance of Diesel-Electric Locomotives.
29.	L. C. WOODHOUSE	Operating Experience with Diesel-Electric Motor-Coach Trains.

Notes on Wiring
by MEGOHM

Domestic Waterheating

Some Suggestions for Converting Existing Installations

IN most trades and professions, a certain amount of work seems to be of a seasonable nature, and as the reason for this is frequently based merely on convenience, the go-ahead business man should anticipate and foster the demand by building up adequate stocks in advance, advertising and window displays, etc., so that there will be no undue delay in carrying out the work.

The present time therefore seems opportune to direct our thoughts towards electrical water heating, as we are approaching the time when the solid fuel kitchen boiler, or the back boiler fireplace, is not required continuously, and other means must be provided to cater for the demand. The average householder naturally does not wish to incur any unnecessary expense, but if the convenience and ease with which constant hot water can be provided, is pointed out to him, he will at least be interested.

Plumbing Work

Some twenty years ago it was common to find firms trading as Plumbers, Gasfitters *and* Electricians, the last-named department being the Cinderella of the three. Today we have gone to the other extreme, and many electrical firms have no staff of their own to deal with the plumbing part of the work. It is a good plan, I think, for these to team up with another reliable firm engaged in that particular trade.

The plumber will frequently be called in to replace a tank, cylinder or boiler which has suddenly become defective and is beyond repair, so if his goodwill is assured, the moment is opportune to suggest to the client that now is the time to do the job properly, or to put in boost-heating at least, while the system is emptied down.

Simple Facts

Without therefore training the plumber to be a full-blown electrician, it might be as well to prime him with a few elementary facts which would normally be outside his particular sphere of activities, but would be very useful for the purposes we have in mind. I would impress upon him that for an ordinary hot bath four units are required to heat the water, starting from cold; that this will take two hours, if a 2 kW heater is installed, and only 80 minutes if the loading is increased to 3 kW. Another useful talking point is the fact that as the system is thermostatically controlled, no attention worth mentioning is necessary, and that in the summer time, when this method of heating is perhaps the most useful, the cost would automatically be less, as the initial water temperature is higher.

If the hoped-for customer decides to postpone the project for the time being, then the opportunity should be taken while the original repair is being done to make all possible preparations in anticipation of a subsequent change of mind.

Suggested Control Unit

Finally, I should like to see a unit on the lines of the cooker control unit for use where a heater is placed in the cylinder in the airing cupboard.

I came across a neat arrangement consisting of three pilot lamps, two 15 amp and two 5 amp switches and three cartridge fuses mounted in a box approx. 9 in. x 9 in. fitted flush with the wall, and facing the door to the bathroom, well out of reach of the bath and the basin. One 15 amp switch was a master-switch for the whole circuit, the other controlled a 2 kW immersion heater with thermostat, one 5 amp switch was for a 120 watt tubular heater used for airing purposes, and the other 5 amp switch controlled a 1 kW convector for heating the bathroom.

This heater was a built-up job fixed inside the airing cupboard and completely enclosed, but functioning through two air vents cut into the framework of the cupboard and covered with louvred grilles completely insulated from all other metal in the room. There was thus no possible danger from shock, room heating, airing and water-heating each had independent control, and the whole arrangement was neat and efficient and completely self-contained.

Even if a 3 kW heater were installed, the total load on a 240 V supply would amount to only 17·2 amps and a first class 15 amp switch would in practice be sufficient to control the circuit.

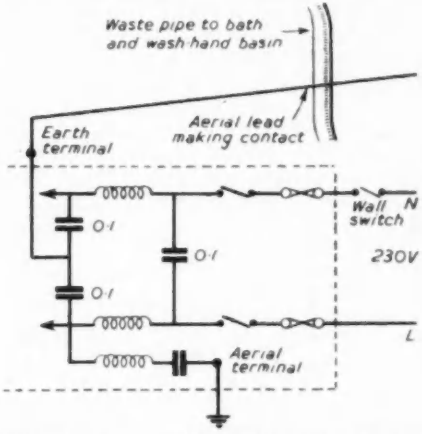
Problems and Practice

IN ENGINEERING

Capacitors cause Shock

WHILST having a bath, a child of four years of age had received a slight electric shock when the water tap on the bath was touched. Another person had also felt a burning or tingling sensation in his hands while washing them under a running water tap on the wash-hand-basin. The electricity supply was 230 V, single phase, a.c., 50 c/s p.s.

Investigation disclosed the following facts. A socket outlet controlled by a single pole wall switch, which was connected in the neutral or earthed side of supply, fed a universal radio set which had the aerial and earth leads interchanged. As the double-pole switch on the radio set was always left "on," the radio was effectively controlled by the single pole wall switch. The insulation of the aerial lead had worn away at one part and allowed the bare conductor to come into contact with a metal waste pipe for the bath and wash-hand-basin. It will be seen from the sketch that under these conditions, even with the single pole wall switch in the "off" position, it would be possible to receive electric shocks due to capacitor currents. That is, in the case of the bath

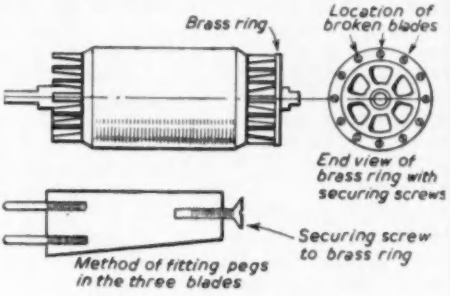


Schematic diagram of incorrect aerial and earth connections which caused electric shock

incident, from live side of supply via 0·1 μF capacitor to earth terminal of radio, via aerial lead to waste pipe, bath water, child's body and hands to the water tap, which was the earthed or neutral side of supply. In the case of the wash-hand-basin incident, from the live side of supply via 0·1 μF capacitor to earth terminal of radio via aerial lead to waste pipe, running water, hands, running water to the water tap which was the earthed or neutral side of supply.—*E. A. R.*

Repairs to Motor Fan Blades

A SIX h.p. s.c. pump motor was received for repairs with three aluminium fan blades broken off close to the rotor. Each blade was fitted back into position by means of


Brass ring
Location of broken blades
End view of brass ring with securing screws
Securing screw to brass ring
Method of fitting pegs in the three blades

Details of fan blade repairs

two brass pegs. As this was insufficient security against further trouble, a brass ring $\frac{1}{8}$in. thick by $1\frac{1}{2}$ in. wide was made and fastened to the tips of all twelve blades by $\frac{5}{32}$in. c.s.h. brass screws. These screws were secured against working loose by centre punching at each end of the slots. The motor was put back into service and after one year the repair was found to be still in good condition.—*W. H. Gatehouse.*

Commutation Trouble

I CAME upon an instance recently which shows the consequences of the amateur in electrical work, apart from jerry wiring. The case in question concerned a small continental d.c. split yoke shunt motor driving a line shaft in a small garage. The complaint was excessive sparking and flashing of the commutator such as to cause alarm. Examination showed that the commutator was blackened and pitted due

to flashing, and the brushes had picked up a good deal of copper dust.

Disconnecting the field and interpole connections, taking care to note each connection correctly, the top half of the machine was lifted and the armature removed for testing. It was taken to the workshop and the commutator was turned smooth, undercut and the armature tested for faults and varnished. Then it was returned to the garage and the remainder of the motor tested for insulation and resistance. The brush rocket and gear was examined and found to be free from fault and in good mechanical condition.

The machine was then cleaned out and assembled, new brushes were fitted and ground to the correct profile with glass paper, and the motor was then connected up and started, without the belt on the pulley.

When the starter was full on, the brushes were sparking more than normal, but less than previously, so the brush rocker was adjusted to effect an improvement, but did not do so.

The motor was switched off and an examination made of the interior, which showed no apparent discrepancies therein. Slipping the belt on to the pulley and disengaging the free pulleys on the lineshaft, the motor was again started up and as the load was increased the sparking became more vicious, although the brush positions were again altered as before. The motor was shut down and the position considered.

Roughly speaking, the fault could be either in the armature or field system, and resistance and insulation values of both, including the interpole circuit, had been satisfactory. The air gap was then tested and found to be practically uniform for each pole, so magnetic unbalance was not a contributing factor.

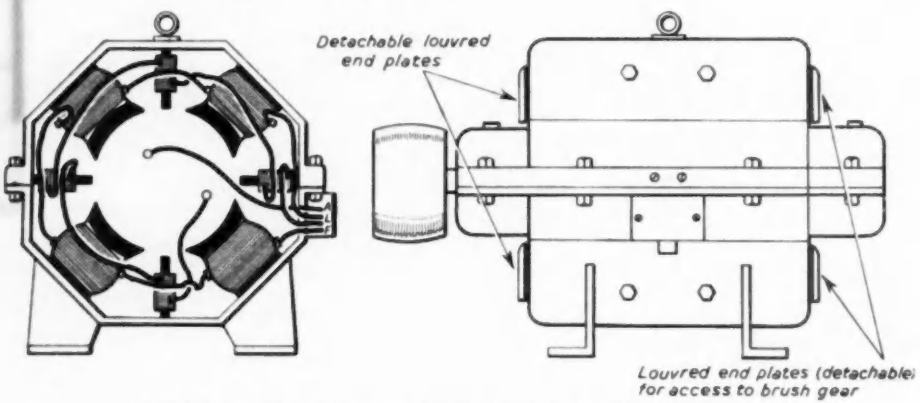
I decided to ask the proprietor whether the motor had been damaged or repaired recently, and inquiry elicited the fact that the drive end bearing had been renewed some short time previously by the garage staff and that the motor had been dismantled by one hand and assembled by another.

This looked like the old story of a wrong connection, and since the motor was running the main field system appeared to be correct. But if the interpoles on the horizontal centre line had been inadvertently reversed, this would have the effect of strengthening the field of the preceding main pole, and, consequently, the armature coils when undergoing commutation, would not be cutting a flux of the polarity required to give a commutating e.m.f.

By using the "right hand screw rule" for each interpole it was found that they would all be of the same polarity when energised. Reversing the connections of the horizontal interpoles and returning the brushes to the marked neutral position, the motor was started up and, on load, gave smooth running and excellent commutation.

It would appear in the first instance when the motor was on no load, the armature current through the interpole coils would not be great enough to produce heavy sparking, but increase of load would strengthen their effect on the armature and produce the flashing complained of.

Thus unnecessary time and money was spent, which could otherwise have been saved by direct approach to an electrical shop in the first place for the renewal of the bearing.—*J. T. R.*



Details of casing and field system of motor which sparked excessively

Battery Powered Welders

Spreading the resistance welder peaks on supply mains

By E. R. SANDERSON, A.M.Inst.C.E., A.M.I.E.E.

THE only way in which electricity can be stored, apart from transient effects, is by the use of storage batteries It is not surprising, therefore, to find that in an attempt to reduce the very heavy single-phase peak on the mains, caused by the conventional a.c. resistance welder, attention should have been paid in the U.S.A. to the possibilities of the storage battery. A note on the subject may be of interest to British welding plant manufacturers, users and electricity supply authorities, since the use of batteries for this purpose does not seem to have been explored fully in Britain.

An American company has investigated the matter very thoroughly, and has produced welding equipment of various types and sizes, making use of the large reserve of power which can be stored in a comparatively small battery. It is claimed that d.c. is superior to a.c. in its welding qualities, and that the use of a battery greatly reduces the peak on the a.c. supply system, whilst at the same time providing for a three-phase balance as explained below.

As an example, the above company produced a battery welding unit having a maximum discharge capacity of 100,000 amps and drawing from the three-phase supply a comparatively steady load of 60 kVA, whereas the a.c. welder which it replaced is reported to have taken a peak current of 7,800 amps at 440 V single-phase from the primary supply to the transformer. This welder made a two inch diameter ring weld on a heavy steel forging.

Another example made by the same firm was that of a flash welder used for aluminium window frames. In this case, the maximum current of 38,000 amps required a maximum demand on the main supply of only 18 kVA, balanced on three phases at approximately 90% power factor. An ordinary a.c. welder for the same duty is expected, by comparison, to require a maximum single-phase peak of 500 kVA at a low power factor. This aspect of the matter is one which is not without distinct interest to electricity supply authorities.

Contactor Control

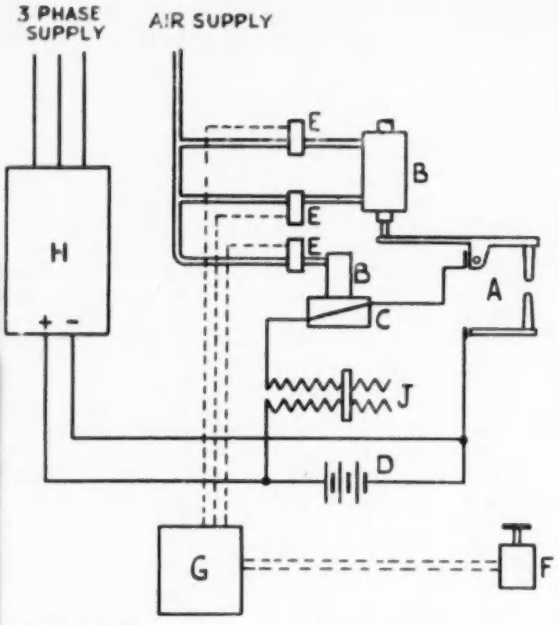
It might be asked how these heavy direct currents are controlled, since the ordinary a.c. welder does not require any form of switch or contactor on the heavy current secondary side of the transformer. This problem was solved by designing a pneumatically operated contactor, which has a number of interesting features and which is the key to the success of the whole scheme. Electrical contact is made through the surfaces of carbon discs of fairly large diameter, which, at the moment of peak current, are pressed together with a total compressive force of about 30 tons. This method of making contact provides a gradual decrease of resistance in the circuit after contact is first made, and a corresponding increase of resistance before the circuit is broken. Very little sparking occurs in consequence, but despite the gradual nature of the build-up of current, this, through the electronic control of the pneumatically applied pressure, takes place with adequate speed for the welding of steel, aluminium alloys and other materials.

A further point about the contactor is the employment of water cooling, since a considerable amount of heat is produced at the carbon surfaces. The action of the contactor is, of course, controlled by an electronic welding timer. It is claimed that for the big d.c. steel welder mentioned above, using 60-cycle a.c. supply, the build-up period corresponds to ¼ cycle, steady current is maintained for 39 cycles, and the decay period corresponds to ¼ cycle. Naturally, different periods are required for welds of other types, and with other metals such as aluminium alloys.

It is claimed that much of the reactance round the welding head and the work, experienced with an a.c. welder, disappears when d.c. welding is used.

Rectifiers

The ultimate source of power is the main a.c. system through an automatically controlled rectifier which supplies the mean demand spread over the whole working period. Compared with the peak welding current, the rectifier supplies a low current continuously to replace into the battery, during rests between welds, the amp/hours taken out during the welds. The rest period being very much longer than the duration of the welding peak, the mean load on the rectifier is comparatively small.



A. Welding head
B. Air cylinders
C. D.C. contactor
D. Storage battery supply peak loads
E. Electrically-operated air valves
F. Foot control
G. Timing control
H. Rectifier supplying the mean load
J. Adjusting resistor

Simplified diagram of a typical battery-powered welder

Rectifiers controlled by relays have been used for this purpose in the U.S.A., but there are designs available in this country which would obviate the use of electro-mechanical parts, thus securing the necessary automatic action with greater reliability. This action ensures that the battery is maintained in the particular state of charge which gives the most efficient operation and minimises the wear and tear on the cells, whilst the rectifier output will automatically adjust itself to the amount of welding in progress from hour to hour. The design of the charger is a point of the greatest importance, and the writer feels that the voltmeter and relay control, used in the American equipments, is likely to lead to battery difficulties which could be avoided by using one of the statically controlled British rectifier circuits.

Type of Battery

In the U.S.A. considerable use has been made of a type of storage battery, first designed and produced extensively in this country for important war service, which is capable of very heavy peak discharges with a minimum of voltage drop. The same type of battery was later made in the U.S.A., and at the end of the war was thus available for various civilian uses. Each individual cell can deal with currents of 3,000 to 7,000 amps, depending upon the welding cycle. Various series-paralleling arrangements are used to provide storage for the varying peak currents and voltages required from one example to another. For instance, the particular unit might require 32 cells of this type, arranged four in series, eight in parallel. An arrangement of water cooling, by means of tubing carrying circulating water, was fitted to the cells in some of these American examples, since the development of heat on a continuous duty of this kind is a matter which must be considered carefully.

The war-time battery mentioned above would not necessarily be the type that would best suit a specially designed battery welder. A number of different designs and sizes of batteries are available, depending upon the exact circumstances, but in all cases the ability to deliver very heavy currents with a minimum voltage drop will be of the utmost importance, coupled with a reasonable battery life under intensive working conditions. To avoid undue voltage loss the batteries should be placed as closely as possible to the welding head. Very heavy conductors are necessary for connecting the cells in series and parallel and for connection to the welder itself, and it has been found advisable to provide water cooling ducts in some of these conductors.

So far as is known, there have been no full tests of this type of equipment in this country, since although there is no difficulty whatever in providing suitable batteries from British sources, and excellent automatic rectifier designs are available, a suitable form of contactor has not yet been produced. Possibly the British Electricity Authority might think the matter of sufficient interest to arrange for the provision of a trial contactor of the right type, so that the whole subject could be explored fully in view of its obvious potentialities for the elimination of the peak loads taken by the normal type of resistance welding equipment.

F.H.P. Motors

Newly Designed Models added to Hoover Range

FRACTIONAL horse power motors in a variety of ratings, frame types and speeds are included in the new range recently introduced by Hoover Ltd. The basic design utilises a squirrel cage type rotor having pure aluminium die-cast through laminated electrical steel, and with cooling fans die-cast integrally with the rotor. The whole assembly is pressed onto a $\frac{3}{8}$ in. dia. shaft. Both sleeve and journal bearings are used in the motor range, the same shaft design doing duty for both types. An attractive feature from the maintenance viewpoint is that oil overflows are provided in the sleeve-bearing types which direct surplus oil outside the end frame. To control end play in ball bearing motors one bearing is secured in its end frame.

Stator laminations are held in an aluminium die-cast body, and stator length is varied according to motor rating. End frames are located on a spigot which is machined to close tolerances, this method of construction providing accurate alignment and good centring of the rotor in the air-gap. Specially reinforced aluminium alloy is used for the end-frames.

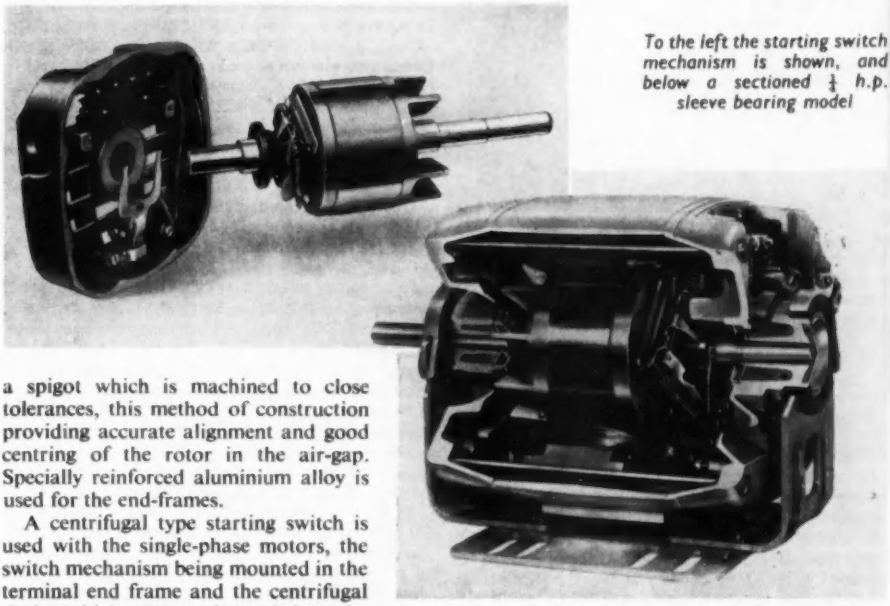
A centrifugal type starting switch is used with the single-phase motors, the switch mechanism being mounted in the terminal end frame and the centrifugal device which operates it carried on the rotor shaft. The switch is of a new design and is shown in the photograph reproduced above.

Both drip-proof and totally enclosed types of motor are available, and by careful design the temperature rise has been kept below 40° C—10° C below the relevant B.S.S. limit.

In a drip-proof frame, motors from 2 to 6 pole are available for both single and three phase operation. For 1 ph models, ratings from $\frac{1}{6}$ to $\frac{3}{4}$ h.p. are available as 2-pole machines, and for 3 ph, from $\frac{1}{4}$ h.p. to 1 h.p. Totally enclosed 1 ph machines are made $\frac{1}{6}$ to $\frac{1}{4}$ h.p., and 3 ph machines in a similar range. At present, no 6-pole, 1 ph totally enclosed motor is available.

Overload Cutouts

An important feature of the new range is the incorporation of a new design of thermal overload cut-out, employing a bimetal strip-operated micro-gap switch. A full range of these cut-outs is available, one to match each of the different types of motor characteristics. Cut-outs can be assembled either for automatic or hand operation, and with the latter system, are arranged that holding closed is impossible.



To the left the starting switch mechanism is shown, and below a sectioned $\frac{1}{4}$ h.p. sleeve bearing model

overseas news

Diesel-Electric Locos for Ceylon

An order for 25 main-line diesel-electric locomotives—the largest single order for such locos yet placed in this country—has been given to the Brush Electrical Engineering Co., Ltd., by the Ceylon Government Railways. Valued at well over £1,000,000, the order is the result of discussions on the final design which took place recently between Mr. B. D. Rampala, chief mechanical engineer of the Ceylon Railways, the Crown Agents for the Colonies and the Brush Co.

The locomotives will be of the AIA-AIA type, with a maximum speed of 55 m.p.h., and are to be fitted for multiple unit working. Each is powered by a Mirrlees JVS.12, 12-cylinder pressure-charged vee-type engine direct coupled to a Brush 635 kW generator, the four traction motors having a continuous rating of 193 b.h.p. each. Operating conditions in Ceylon are arduous, heavy gradients from sea level up to an altitude of 6,200 ft being encountered.

Queensland's Subsidies

A broadening of the basis of the Queensland Government's subsidies to regional electricity boards has been announced. The present system of paying subsidies is based on meeting part of the deficit incurred by electricity boards when new plant is operating, up to a maximum of 33⅓% of capital expenditure. Thus, while the new plant is being erected, interest and redemption are also building up to become a heavy overhead burden on them. It is now proposed to pay 33⅓% of the loan expenditure on new plant as it is incurred. This should work out cheaper both for the boards and the Government. This new scheme is to operate for five years. The State Premier also announced that an investigation would be made by the Electricity Commissioner (Mr. Cochran) and the Works Co-ordinator-General (Mr. Kemp) to attempt to devise a method of supplying electricity to smaller towns at an expenditure within the income of the local people.

Subsidies in N.S.W.

The Electricity Authority of New South Wales is also to review the Rural Electricity Subsidy Scheme, and to consider the desirability of increasing the limit of capital expenditure on which subsidy is to be allowed. At the present time the limit is £250 per consumer, but the increasing cost of materials has now placed many potential extensions beyond that figure.

Work at Newcastle

A special loan of £220,000 by the Electric Supply Department to help cover commitments of £259,000 for plant equipment, was approved by the Newcastle (N.S.W.) city council earlier this month. The report of the undertaking for 1949, presented by Mr. Nash, acting electrical engineer and manager, showed a net trading deficit of £17,464. It is not proposed to make any increase in domestic or residential tariffs, but commercial and ordinary power users will have their present surcharge increased from 12% to 24% on the basic charge as from April 1.

Hume Dam Scheme

The Hume Dam Hydro-Electric Development (Construction) Bill was introduced in the N.S.W. Legislative Assembly earlier this month. This measure provides, *inter alia*, for the establishment of a 75 MW hydro-electric station at Hume Weir, to be built by arrangement between the Governments of N.S.W. and Victoria and the River Murray Commission. Cost of the station is estimated at £2,100,000.

Shunting Locos for N.S.W.

Ten diesel-electric shunting locomotives for the Department of Railways, New South Wales, are to be supplied by the British Thomson-Houston Co. The mechanical parts will be built by Metropolitan-Cammell Carriage and Wagon Co., and each locomotive will have two Davey Paxman 500 h.p. engines each coupled to a B.T.H. generator. The complete electrical equipment (generators, motors and control) will be made by B.T.H.

Australia's Production

The local output of electrical appliances exceeds the domestic demand, Australia's Minister of Supply, Mr. Casey, stated recently, and domestic production and imports combined are now some 25% to 30% above the demand. Local manufacturers enjoyed a price advantage up to 25% as compared with the foreign rivals' goods, however, and the quality and design of Australian-made electrical appliances were at least equal to that of goods made in the U.K., he maintained. Nevertheless the local firms are concerned at the inflow of foreign products.

Melbourne Tube?

A proposal for an underground railway system in Melbourne is to be investigated by the State Parliamentary Works Committee. The Minister of Transport, Mr. Guye, recommended the investigation and the Cabinet has approved the suggestion.

Delay at Howard Station

The manager of the Wide Bay Regional Electricity Board, Queensland, reported to the board

that it was becoming obvious that at the present rate of building the Howard power station would not be completed before September, as was originally intended. There was such a large amount of work to be done on the inlet works that it seemed unlikely it would be completed to enable operations to begin as early as scheduled. Disappointment was also expressed at the delay in extending power lines, due to shortage of material.

Cable Development

A further development in cable manufacture in Australia is the announcement by Olympic Cables, Ltd., of Victoria, that they intend to make p.i.l.c. power mains cables in the near future. The firm now has a large cable-making plant, and manufactures more than 2,000 types of cables. As part of the development scheme, the directors are considering certain plans for the alteration of the present capital structure of the company.

Diesel-Electric Locos for Australia

A report on the operations of the Australian Commonwealth Railways tabled recently in the House of Representatives foreshadows the use of diesel-electric locomotives on the Trans-Australian railway. The purchase of new, fast passenger locomotives for this railway is now considered necessary, says the report, and investigations have shown that the diesel-electric locomotive is the obvious choice of power. Operating conditions on this railway, where water supply problems are more difficult than on any railway in the world, and where coal has to be obtained from New South Wales at a freight cost of £2 10s. per ton, continues the report, make the introduction of diesel-electric power an attractive proposition, especially as the present times between Kalgoorlie and Port Pirie would be halved. It is estimated that some £230,000 a year would be saved in operating costs if diesel-electric locos were used.

Paris-Lyons Railway

The first section of the Paris-Lyons railway electrification from Laroche to Dijon, a distance of about 100 miles, was opened last week by France's Minister of Transport. (A description of the project was given in our August 25, 1949, issue.) This is the first completed section of an ambitious plan to electrify the whole of the line from Paris to Marseilles. The completed section includes a special layout enabling all signals and points on 16 miles of double track to be controlled from the Dijon signal-box. Extensive modification of the existing line was necessary to allow for the increase in the maximum speed to 86 m.p.h., and the installation of o.h. cables. Work was begun on the section just before the outbreak of war and resumed three years ago. At the inaugural ceremony last week, the special train covered the distance in 92 minutes—an average speed of about 65 m.p.h. Power is obtained from the Genissiat hydro-electric station in the Rhone Valley, via 52 substations.

It is planned to electrify the remainder of the 227 miles from Paris to Dijon this year, and the 318 miles of track to Lyons by 1953.

Quebec Development

The Quebec Legislative Assembly this month adopted the Bill under which the Quebec Hydro Electric Commission will acquire an installation on the Upper Ottawa River at Rapid Seven, transmission lines in the area, storage works forming the Dozois reservoir, rights on the water powers of the Upper Ottawa River for 75 years, rights and privileges of developing water power at Rapid One.

Ontario's Schemes Nearly Ready

Power rationing would be unnecessary this year, Mr. R. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, stated at the recent joint conference of the Ontario Municipal Electric Association and the Association of Municipal Electrical Utilities. By next July three 60,000 h.p. units of the Des Joachims hydro-electric development should be operating. In addition, the initial stage, 80,000 h.p., of the Pine Portage project on the Nipigon River was expected to be ready by September, and the 56,000 h.p. Tunnel generating station on the Mississagi River should be in service in June.

Coal in Rhodesia

Wankie Colliery, which supplies the fuel requirements of many power stations in Rhodesia, has announced an increase of 2s. a ton on coal, making the price 12s. a ton. To the Electricity Supply Commission of South Rhodesia this will mean an additional £21,000 in working costs next year. The Bulawayo city council, too, view the increase with concern.

Chinese Factories' Move

The exodus of Chinese industrial plants from Shanghai to inland cities is beginning to assume a wholesale character partly because of the electric power shortage and Kuomintang blockade, and partly to be nearer the sources of raw materials, it is reported. New sites chosen by transferring plants range from Soochow, on the Shanghai-Nanking railway about 60 miles west of Shanghai, to Harbin, in Northern Manchuria. In the majority of cases, workers are given the choice of either being paid off in Shanghai or transferred with their families to the new location. Leading the present exodus are the Asia Electric Works, the Kai Lin Electric Works and the Hsin An Electric Plant, all of which have chosen Tientsin as their new home. The Hwa Electric Lamp plant is to re-establish itself in Harbin, to which town the Tienshan Industrial Co., makers of bakelite powder, is expected to move shortly.

PERSONALITIES IN THE INDUSTRY

Today, March 23, **Prof. E. B. Moullin,** M.A., D.SC., M.I.E.E., president, and **Mr. W. K. Brasher,** M.A., M.I.E.E., secretary of the Institution of Electrical Engineers, sail in the R.M.S. *Capetown Castle* for South Africa to take part in the second Commonwealth Conference of Representatives of Engineering Institutions, to be held in Johannesburg next month. They will be accompanied by **Mr. V. A. M. Robertson,** C.B.E., M.C., M.INST.C.E., M.I.E.E., president, and **Mr. E. Graham Clark,** C.B.E., M.C., B.SC., M.INST.C.E., secretary of the Institution of Civil Engineers, and **Dr. S. F. Dorey,** C.B.E., M.I.MECH.E., F.R.S., president, and **Sir Henry Guy,** C.B.E., D.SC., M.I.MECH.E., F.R.S., secretary of the Institution of Mechanical Engineers. The party will return to this country in May.

London Transport announces that **Mr. L. B. Hewitt,** A.M.I.E.E., has been appointed stores standardisation officer in the department of the chief technical planning and supplies officer. He was previously works and divisional engineer (rolling stock: trams and trolleybuses) and has served for 42 years with London Transport and its predecessors, mostly in connection with the tram and trolleybus side.

R. W. Gregory and Partners, consulting engineers, of Newcastle-upon-Tyne, announce that they have opened an office at Refuge Assurance Buildings, 18 Baldwin Street, Bristol, and that they have taken into partnership **Mr. L. C. Rettig,** F.I.E.S., ASSOC.I.E.E., who will be resident partner in charge at that office.

Newly appointed chief executive of British Insulated Callender's Cables, Ltd. (as we briefly noted last week), **Mr. W. H. McFadzean,** C.A., deputy chairman, played a very prominent part in the negotiations leading up to the merger of the B.I. and Callender Co's. He was appointed to the Board on the formation of the present concern as an executive director. In 1947 he became a deputy chairman and now combines that office with his new appointment. He is relinquishing all other directorships, but expects from time to time to maintain his overseas visits, which, in recent years, have enabled him to obtain first-hand knowledge of the B.I.C.C. interests abroad. Two new directors of B.I.C.C. are **Dr. L. G. Brazier,** PH.D., B.SC., M.I.E.E., A.F.R.AE.S., F.A.I.E.E., and **Mr. H. J. Stone,** M.C., M.I.E.E. The former joined the old Callender's Co. in 1925, and specialised in high voltage transmission research and development. After the merger he became director of research of the new concern, a position he still retains. Mr. Stone is also well known throughout the industry, having been with B.I.C.C. and the former B.I. Co. since the end of the first world war.

At the meeting of the Barnsley Town Council last week, **Alderman Leach** was invited to become Mayor for the ensuing year. He is, of course, chairman of the Yorkshire Electricity Consultative Council.

Following the exchange of shares between the Telegraph Construction and Maintenance Co. Ltd., and Johnson & Phillips Ltd., made in 1947 to foster closer business association and technical collaboration between the two companies, it has now been arranged to strengthen this link by an exchange of directors. **Mr. William Glass** has been appointed to the Board of directors of the Telegraph Construction and Maintenance Co. Ltd., and **Mr. John N. Dean** to the Board of directors of Johnson and Phillips Ltd.

In recognition of his long service to Plymouth and Cornwall branches of the Electrical Contractors' Association, a silver salver was presented to **Mr. F. R. Madge,** of Madge and Son, at the branch's annual dinner, in the Duke of Cornwall Hotel, Plymouth, last week.

Mr. H. G. Meads and **Mr. C. H. Crowlie** have been appointed directors of Hoover (Electric Motors), Ltd.

Mr. W. H. McFadzean

Dr. L. G. Brazier

Mr. H. J. Stone

Following the appointment of **Mr. M. J. L. Pulling** as senior superintendent engineer, B.B.C. Television, **Mr. A. P. Monson** has succeeded him as superintendent engineer, recording. Mr. Monson joined the B.B.C. in 1933 from Creed and Co., Ltd. He became head of the transcription recording unit in 1941, and assistant superintendent engineer, in the recording section, in 1943.

President of Babcock and Wilcox Co., of New York, Mr. A. Iddles, has been appointed a director of Babcock and Wilcox, Ltd., in place of **Mr. A. G. Pratt,** who has resigned his seat on the board.

Mr. A. G. Colston, Mr. S. Roberts and **Mr. A. R. Northover** have been appointed directors of Hoover (Washing Machines), Ltd.

Among those elected Fellows of the Royal Society last Thursday, we note the names of **Dr. F. C. Williams,** O.B.E., D.Sc., D.Phil., A.M.I.E.E., Professor of Electro-Technics, University of Manchester, who is noted for his work on radar and the development of electrical computing machines; and **Dr. L. E. Sutton,** M.A., D.Phil., demonstrator and lecturer in physical chemistry, Oxford University, who is distinguished for his work on the electrical properties of molecules. A new overseas Fellow of the Society is **Dr. D. F. Martyn,** principal scientific officer, Commonwealth Scientific and Industrial Research Organisation, Canberra, who has made notable contributions to various aspects of scientific radio.

At the annual meeting of the Society of Irish Electrical Traders **Mr. R. S. Simmonds** was elected president and **Mr. P. Abels** vice-president.

At present an assistant divisional engineer in the chief engineer's department of the London County Council, **Mr. J. Galloway,** M.I.E.E., has been recommended for the position of divisional engineer in that department, with effect from April 1. Educated at Dumbarton Academy and Glasgow Technical College, Mr. Galloway subsequently spent some years in India on behalf of McKinnon, McKenzie and Co. Since joining the L.C.C. in 1928, he has been in charge of the engineering equipment in the completion of the County Hall, and for the new County Offices. He is also responsible for the design of the engineering equipment for the Concert Hall in the new South Bank scheme.

Mr. H. J. Nichols, C.I.E., D.Sc., M.Inst.C.E., A.M.I.Mech.E., has been appointed registrar and secretary of the Professional Engineers Appointments Bureau in succession to **Mr. R. W. L. Harris.**

Formerly with Messrs. Brown and Co., Ltd., of Ceylon, **Mr. C. G. Marks** has joined the staff of the British Central Electrical Co., Ltd., as personal assistant to **Mr. G. Conradi,** managing director.

The D. P. Battery Co., Ltd., has appointed **Mr. R. M. Robson,** B.Sc., as chief engineer in succession to **Mr. H. G. Brown,** who has retired. Educated at Manchester Grammar School, Mr. Robson graduated at London University after attending part-time courses at the Royal Technical College, Salford, and and the College of Technology, Manchester. He joined the Chloride Electrical Storage Co. in 1926, and after a period of training in all departments, served on the technical staff until 1943 when he joined the D.P. Co. as assistant to Mr. Brown. The latter's services, by the way, will still be available to the D.P. Co. in an advisory capacity.

Until recently manager of the Insulation Department of Lewis Berger and Sons, Ltd., of Homerton, **Mr. H. C. de Vroome** has resigned that position to form a new company—Devroome Developments, Ltd.—to make electrical insulation materials. Mr. de Vroome, who is well known in E.R.A. and B.E.A.M.A. circles, was responsible for much of the pioneer work on modern high-speed synthetic impregnating varnishes. He is also noted for his more recent work on high temperature insulation and automatic conveyor impregnating processes.

Mr. H. C. de Vroome

The Hon. Sir Frank Beaurepaire, chairman, and **Mr. C. Grainger,** technical director and vice-chairman of Olympic Cables, Ltd., Melbourne, Australia, are expected to arrive in England early next month. They may be contacted c/o the Agent General, Victoria House, Strand, London, W.C.2.

Our notes last week on the Batti-Wallah's ladies' night referred to the chairman as Mr. Forbes Graham. This should, of course, have been **Mr. Forbes Jackson.**

We are asked to make it clear that **Mr. T. A. Fielding,** who has now joined Electrowares, Ltd., as noted in our March 2 issue, was formerly manager of the Bristol sales office of the General Accessories Co., Ltd.

OBITUARY

It is with regret that we note the death on March 14 of **Mr. A. L. Coward,** M.I.E.E., age 64, partner in the firm of Highfield and Roger Smith, and manager of that firm's Birmingham office. Educated at Blackburn Grammar School and the Manchester Municipal School of Technology, he gained extensive experience with Dick, Kerr and Co. and the English Electric Co., in the installation of electrical plant, notably the h.v. d.c. generators for wireless telegraphy at Poldhu and Caernarvon, and the h.v. d.c. series system installed by the Metropolitan Electric Supply Co. He joined Highfield and Roger Smith in 1923 as assistant engineer, supervising extensions at the Upper Boat power station during the following five years. Later he was placed in charge of the firm's Birmingham office, being in control of the construction of the 132 kV grid lines and substations in the C.E.B's Central England area. He became a partner in the firm in 1938. A memorial service is to be held at St. Phillip's Cathedral, Birmingham, on 28 March at 2.30 p.m.

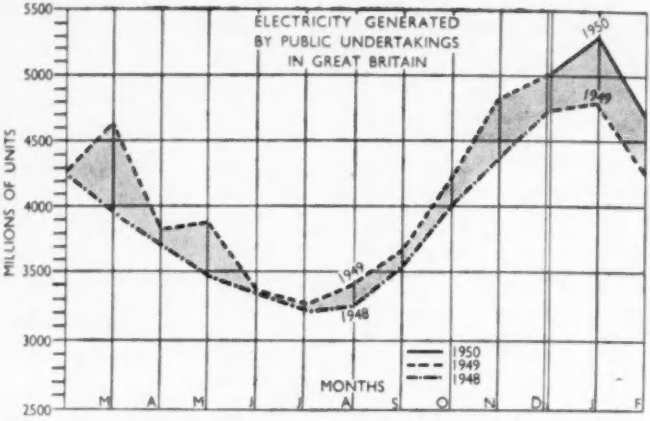
The death occurred on March 18 of **Mr. C. H. Thatcher,** aged 69, who, until his retirement four years ago, was chief engineer to the G.P.O. at Mount Pleasant, London.

UNITS GENERATED

During the month of February, 1950, a total of 4,724 million units was generated in stations under the control of the B.E.A. and the North of Scotland H.E. Board. The corresponding figure last year was 4,242 million, so there has been an increase of 11·4%.

Of the total, 4,599 million units were generated in steam stations and 106 million units by hydro-electric.

Energy sent out during the month was 4,466 million units, 94·6% of that generated. This gives the total for the calendar year 1950 as 9,453 million units, an increase of 11·5% on 1949



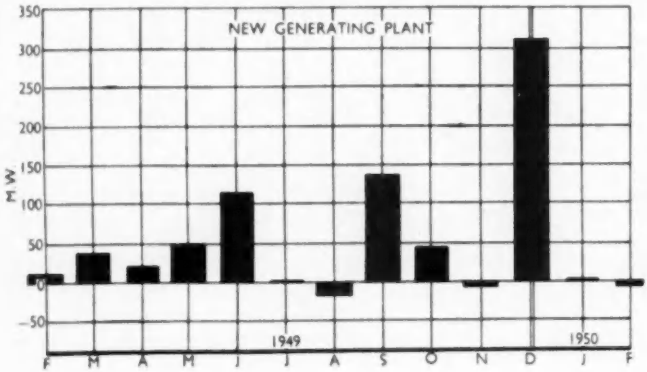
POWER SUPPLY IN FEBRUARY

FEBRUARY'S returns of the Ministry of Fuel and Power showed that the installed capacity of the B.E.A. generating divisions, based on generating sets alone, fell by 5 MW during the month, no new sets being installed. However, the boiler installation programme made good progress, units being installed in four stations, and as a result of these the output capacity of the system has been substantially increased.

Largest of the boilers installed is that at Kingston "B" (South-Eastern Division), where the commissioning of a 260 klb/hr Stirling tri-drum unit leaves two more similar units and one 30 MW set to complete the station. At Ferrybridge, in the Yorkshire Division, the first of four scheduled 180 klb/hr Mitchell boilers is now in operation, while in the North-Western Division the completion of extensions at Kearsley is brought nearer by the completion of the sixth 173 klb/hr boiler to be installed in the past year. All of these are of Babcock and Wilcox, 600 lb/in. design. Finally, in the month's progress report comes Walsall, in the Midlands Division, where the fifth of the 12 scheduled 150 k lb/hr Babcock and Wilcox boilers has been brought into operation.

North of Scotland

Last month we noted an increase of approximately 1 MW in the installed capacity of the North of Scotland H.E. Board. This is accounted for by a 1 MW diesel set installed at Dunoon, while in the same month a 75 kW diesel set came into operation in the island of South Uist. It should be noted, incidentally, that the figures for the North of Scotland given in this page every month include, unless otherwise stated, the Lochaber Power Co. as well as the H.E. Board.



GENERATING PLANT

At the end of February the installed generating capacity of the B.E.A. was 13,583 MW, 5 MW less than at the end of January. The North of Scotland H.E. Board total has increased by 1 MW to 327 MW, and so there has been an overall increase during the past 12 months of 660 MW, or 5%.

The installed capacity, used for the purpose of this graph, should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets, which are connected on both steam and electrical sides and are suitable for use

Single-Anode Rectifiers

Continental Development of High Power Types Surveyed in I.E.E. Paper

BY 1935 several well-known types of multi-anode mercury-arc rectifiers were being made on the Continent, and at about that time limits for the multi-anode system appear to have been reached. Thereafter attention was directed to the design of rectifiers using single anodes, and the resulting development forms the subject of DR. H. VON BERTELLE, DIPL. ING., DR.-ING., A.M.I.E.E. (Nevelin Electric Co., Ltd.), in the paper, "The Continental Development of Single-Anode Mercury Arc-Rectifier Valves of High Power," which was read before the Institution of Electrical Engineers on Thursday last.

The paper begins with a survey of the salient features of multi-anode valves, both glass bulb and steel tank types. Anodes are usually graphite rods mounted on conductors passing through an insulating vacuum-tight seal in the envelope of the rectifier, there is a mercury-pool cathode in the bottom of the rectifier, and the voluminous space above the cathode forms the cooling system for the mercury vapour. Heat dissipation is usually by air cooling, and for steel-tank types a wide variety of shapes has been used.

Rectifier efficiency depends largely on the voltage drop in the arc, and it is important to keep this low, especially for continuously rated plant. Other points important in judging performance are reliability and amount of maintenance required. Both of these are very good for glass bulb rectifiers and better than rotary convertors for steel tank types. A low frequency of backfires, effectively short circuits, is also necessary; when they occur the current must be rapidly interrupted, and fast operating fuses are used for this purpose in the case of a glass bulb and small steel tank units. For large steel tank types negative potential is applied to the grid as a means of obtaining rapid suppression of the current.

Vacuum Considerations

Mercury-arc rectifier operation is based on a few especially favourable operating properties of the low-pressure mercury vapour discharge, and these are easily nullified by the presence of even small amounts of impurities in the vapour. Such impurities come from various sources, but with glass-bulb units, overall heating can be used to remove occluded and absorbed gases. These may remain with steel tanks where such heating is impossible and in addition some leakage in of gas may occur. With rectifiers up to 1 kV experience has shown that the partial pressure of impurities should not exceed 0·1 micron.

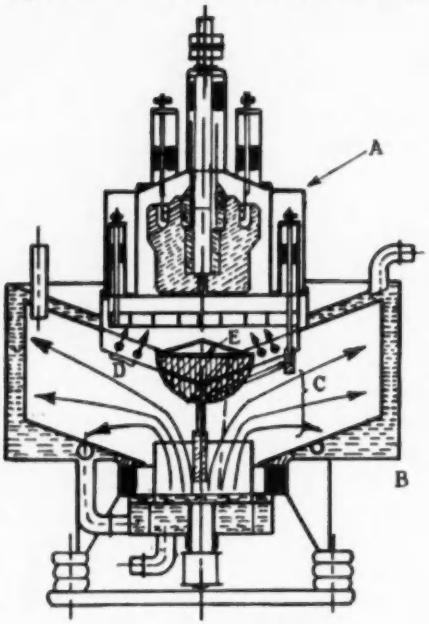
Change to Single Anodes

Table 1 shows the various requirements to be met by mercury arc rectifiers and the design features required. Some, as is apparent, are contradictory, and the requirement for greater efficiency coupled with limitations on increase in size have led to the change from multi-anode systems to designs employing single anode units without a vacuum pumping system. The same reasons operating in the U.S.A. led Dr. Slepian to the development of the ignitron a discharge valve having only one anode. Rectifiers, using ignitron methods, were also tried, but the only advantage was found to be the possibility of a surprisingly high intermittent load without backfiring. It was eventually found that all the practical experience obtained in 20 years of multi-anode rectifier design was insufficient for satisfactory progress towards a high-power single-anode valve.

Table I. Requirements for Rectifier Design

Requirement	Solution
(*a*) Economy in manufacture and installation of mercury-arc rectifier plants for electrolysis. (*b*) Economy in transformers, switchgear, auxiliaries. (*c*) Economy in maintenance and spare parts.	Keep number of units per plant low by using a few large mercury-arc rectifiers operating at full current.
(*d*) Economy in service:	
(1) reliability ...	(1) Operate below full current with increased number of units.
(2) efficiency ...	(2) As for (1), and even increase number of rectifier units still further, by using a smaller type, and provide short, open, arc-path.
(*e*) Economy in manufacturing.	Concentrate on production of a few types, preferably of small size.
(*f*) Ease of transport and handling on site.	Employ the smaller types.
(*g*) Increase of control accuracy. (*h*) Increase of operating voltage (up to 100 kV and more).	Decrease influence of the individual anodes on each other, shield and lengthen the arc path, mostly by increasing the dimensions.

As already mentioned, mercury arc rectifiers are made in a wide range of shapes, yet investigation has shown that units dissimilar in construction work equally reliably and have similar electrical characteristics. This has led to the conviction that some internal features must exist which are common to all rectifiers and are responsible for their electrical performance.



Single-anode valve for 750 V 500 A

A. Anode system with glass pressure seals for high operating temperatures. B. Cathode system, soft-soldered to steel container and water cooled bottom. C. Flow lines, indicating the direction of vapour flow between cathode and cooling surface. D. Orifice to anode space. E. Baffle between cathode and anode

With this consideration in mind, the relationship between the electrically active space and the inactive vapour space may be calculated. To enable comparisons to be made between various rectifiers, three significant functional characteristics are defined:

$$\text{Specific electric space} = \frac{\text{anode} + \text{cathode space}}{\text{nominal current}}$$

$$\text{Specific vapour space} = \frac{\text{volume} - \text{elect. space}}{\text{nominal current}}$$

$$\text{Specific cooling surface} = \frac{\text{total cooling surface}}{\text{nominal current}}$$

Table 2 shows the range of values obtained for various types of rectifier.

Single Anode Rectifier Design

Three design rules have been derived from the functional treatment described.

(1) The narrowest cross section of the arc must not produce ion deficiency at the highest current likely to occur and at the coolest operating conditions.

(2) Anode space and anode temperature have to be so arranged that an increase of the sparking potential occurs faster than the rise of the negative anode voltage under the most unfavourable control conditions.

(3) Location of the orifices of the anode space has to be such that the minimum of disturbance is possible owing to the irregular motion of the mercury-vapour schemes.

Based on these general principles an experimental sealed-off single-anode rectifier was built, rated at 750 V, 250 amp. The anode system was carefully screened with a dish-like baffle which both deflected the vapour stream and served for de-ionisation of the vapour space. A steady vapour cushion was found to exist under the baffle, and this seemed to deflect the jets of vapour to the condensing walls, without even approaching the orifices of the anode space.

It was found from experience that ignitron operation could not improve on that with continuous excitation, and that continuous excitation did not seem to alter the voltage strength. Moreover, contrary to the views of some designers, overload tests showed that ion deficiency was the only limiting factor in current rating. With modified cooling surface arrangements the rating of the experimental type of valve was doubled with no increase in

Table 2. Characteristics of Geometrical Arrangement of Rectifiers

Type of Rectifier	Specific electrical space, litre/amp	Specific vapour space, litre/amp	Specific cooling area, cm^2/amp	Cooling surface loading, watt/cm^2
Glass bulbs, small	0·02-0·03	0·05-0·1	44-54	0·20
large	0·04-0·06	0·10-0·19	19-30	0·22-0·43
Large pumped steel tanks (water-cooled)	0·08-0·14	0·68-0·18	54-70	0·40-0·65
Small pumpless steel tanks	0·04-0·52	0·15-0·20	18-28	0·22-0·30
Steel tanks, buoy-shaped	0·06-0·08	0·18-0·45	35-44	0·25-0·58

the overall dimensions above that of the experimental model.

Since each single-anode unit could be handled by two men, it was possible to dispense with the wide bays and cranes required when big multi-anode steel-tank rectifiers were employed. The comparison given in Table 3 is enlightening.

Table 3. Comparison of a 5,500-amp Steel Tank with 18 Anodes with a Group of 12 Single-Anode Valves

	Steel tank	Single-anode valve
Arc drop	32 volts	18·2 volts
Weight (water included)...	12·5 tons	4·5 tons
Floor area required ...	530 sq ft	140 sq ft
Total space occupied by plant	10,200 cu ft	1,760 cu ft

Principal disadvantage of the modified design was the difficulty of maintaining a perfect vacuum, the cathode insulator seal being a special problem, accentuated by war shortages. However, ease of replacement (one or two hours per valve) made this less important than it would have been with a multi-anode unit.

The experience acquired in this development has formed the basis for the design of single-anode, high voltage units, voltage fluctuations within limits of 2 to 3%. Similar designs were used in 100 kV prototype units for h.v. d.c. transmission.

DISCUSSION

Dr. W. G. Thompson (G.E.C.) emphasised the difficulty of dealing with the mercury arc rectifier, because of the large number of variables involved in its design. Although theoretical attempts had been made from time to time to reduce some of the empirical data to an orderly array, some slight modification in design or some slight change of material could completely revolutionise the performance of a particular geometrical arrangement. The buoy type of rectifier was the result of theoretical considerations, but its use had been largely discontinued; it did not compare favourably with designs with a more empirical background.

The main attraction of the single-anode rectifier, when first introduced, was thought to be its low arc drop, which it was hoped, with the anode close to the cathode, would be only about 10 volts. That hope had not been realised, and there had been difficulty in this country, where the single-anode rectifier had not found so much favour as elsewhere, in establishing what the actual arc voltage drop was, so that the figure of 18·2 volts quoted in the paper was very welcome. In comparing the performance data of single and multi-anode types, he had been surprised by the small margin on either side.

Dr. J. C. Read (B.T.H.) said that for e.h.v. work the single-anode rectifier was no doubt the right type. The main interest of the paper, however, related to the lower-voltage type, such as the single-anode valve for 750 V, 500 amp, shown in the paper. So far as efficiency was concerned, the arc drop was given as 21 V in the B.I.O.S. report on mercury arc rectifier practice in Germany, while even the figure of 18·2 V given by the Author was not sufficient, in comparison with rectifiers built by more than one maker in this country, to show a decisive advantage. With regard to space occupied, the type shown in the paper seemed complicated and bulky for its rating.

Mr. D. L. Smart (English Electric) suggested that rectifier development on the continent had been affected by the pressure put on manufacturers to produce more efficient plant for large electrolytic duties, whereas rectifiers in this country had been designed, at any rate up to the war, more for industrial and traction duties. At the time when it was decided on the continent to continue the development of single-anode rectifiers, similar considerations of analysis of design led to much further development in this country of the pumpless multi-anode steel rectifier. With good manufacturing technique it was normal for steel tank rectifiers of welded construction to be perfectly vacuum-tight, and certainly to have a leakage of less than 1 micron in two or three months.

Dr. H. St. Pirani dealt with the impurities in the gas content of the rectifier. The Author spoke of the diffusion of impurities, which must be mainly hydrogen, from inside the rectifier into the walls. The speaker had calculated that 0·5 c.c. of hydrogen n.t.p. per 100 grams of steel were absorbed during a test run of 50 hours during which a continuous stream of hydrogen was fed into a rectifier, so that it would require three weeks to saturate the steel. What would happen afterwards he did not know.

Mr. A. J. Haselfoot (A.S.E.A.) said that the trend of development in Scandinavia had been towards a reduction in the number of anodes, but instead of going to the single-anode rectifier the three-anode rectifier had been found an acceptable compromise. It was an air-cooled steel-tank rectifier, with a high-vacuum mercury pump exhausting into a pre-vacuum tank.

Mr. F. G. Stevens (Hackbridge & Hewittic) said the paper contained very useful data relevant to the general design of mercury arc rectifiers, and showed that the factors in favour of the glass bulb rectifier were very strong and helped to explain why the history of the glass bulb had been uneventful and yet successful.

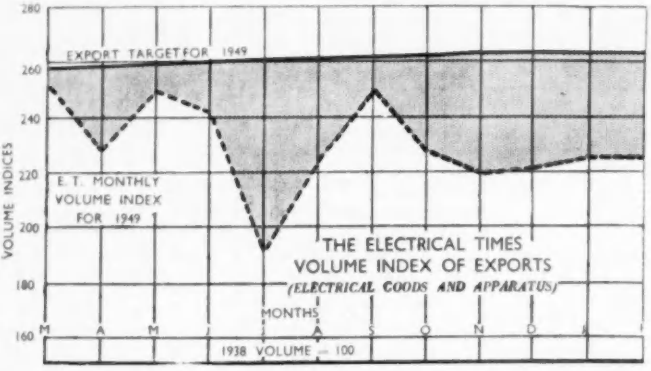
Mr. E. Gallizia (G.E.C.) emphasised the need for care in applying the data given in the paper, and, in connection with the surging which took place in attempting to load a cold rectifier, mentioned the case of a rectifier which could be loaded to 4,000 amp at 500° C. instantly, but after four minutes surging commenced, and for two minutes the current had to be reduced to 2,500 amp, while over a further two minutes it could be built up again to 4,000, the rectifier going through a period of ion starvation.

The Author briefly replied.

EXPORTS AND IMPORTS

EXPORT VOLUME INDEX

Trade returns for the second month of 1950 show that £6,435,298 was the value of the electrical goods and apparatus exported during that period. This is equivalent in volume to 226% of the 1938 achievement, and maintains the quantity reached by this section of the electrical industry in the last few months. It is, however, well below the most recent export target figures available.



WITH fewer working days (24) compared with January (26), a small decrease in the volume of goods exported is recorded in the monthly Trade and Navigation accounts of the U.K., published this week; for all electrical equipment this amounted to £1,173,495. Again, the export of electric generators up to 200 kW reached a notable figure—£1,291,249—being a further £168,213 above the high total for February. Of the former total, sets to a value of £1,053,002 went to the Soviet Union. Also notable is the reduction in the volume of radio equipment, which dropped to £599,177 for the month. Electric irons, however, continue to show a steady increase, their value exported in February being £34,963 as against £31,423 in January.

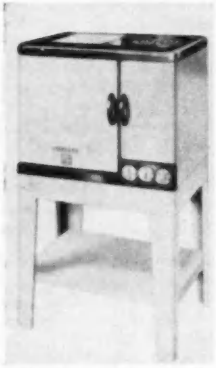
Of all electrical items exported last month, Australia took goods totalling £1,695,721, India £935,014, and South Africa £857,773, the corresponding figure for Canada being £237,031.

Description	EXPORTS VALUE Month of February			IMPORTS VALUE Month of February		
	1948 £	1949 £	1950 £	1948 £	1949 £	1950 £
Telegraph and Telephone Wires and Cables—						
Submarine	77,156	78,654	108,163			
Other	498,708	602,284	832,422	9,952	3,080	11,799
Rubber Insulated	345,096	432,334	238,090			
Insulated, other than Rubber	620,899	914,117	983,571			
Wireless Apparatus, including Valves	729,630	572,599	599,197	36,770	75,411	115,675
Telephone and Telegraph Apparatus	697,651	1,172,104	1,482,726	1,616	4,389	6,968
Electric Lighting Appliances, Accessories, Fittings and Parts :—						
Bulbs and Discharge Lamps	114,159	128,167	121,063	4,697	8,041	21,157
Other Descriptions	330,220	388,362	251,322	9,601	22,347	9,952
Batteries (primary)	48,686	102,859	81,243	—	—	—
Accumulators, Portable	221,682	202,151	178,801	—	—	—
,, Stationary	49,610	33,151	19,316	—	—	—
,, Parts and Accessories	61,989	75,898	30,181	—	—	—
Electric Cooking and Heating Appliances	274,999	255,060	224,924	—	—	—
Ammeters, Voltmeters, etc., and Parts	95,049	77,858	97,720	17,925	23,926	17,459
House Service Meters	136,071	144,637	99,714			
All Other Instruments	72,492	76,915	84,433			
Electro-Medical Apparatus	25,402	35,453	29,563	—	—	—
X-Ray Apparatus, etc.	27,711	74,387	50,386	38,207	40,879	14,339
Insulating Materials	136,220	103,337	147,848	—	—	—
All Other Articles	225,947	370,045	347,841	47,946	62,356	77,669
TOTAL OF GROUP	4,941,524	6,149,262	6,435,298	166,714	240,429	275,018
Electrical Machinery :—						
Generators (not exceeding 200 kW)	230,122	481,199	1,291,249	91,094	11,987	14,843
,, (exceeding 200 kW)	122,955	306,309	292,553			
Parts	162,214	145,980	173,846			
Motors	439,676	867,996	667,427	25,169	31,099	33,312
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,099,937	1,281,208	1,600,733	6,992	4,629	12,824
Fans, Electrically and Power Driven	62,639	132,763	169,551	—	—	—
Vacuum Cleaners and Electrically Operated Appliances	184,130	257,542	249,278	2,307	1,977	7,491
TOTAL APPLIANCES AND MACHINERY	7,243,197	9,622,259	10,879,935	292,276	290,121	343,488

The BUYER'S *Column*

Two New Table Cookers by "Revo"

LATEST arrivals in the "Revo" cooker family are two bonny "babies," the "Peerless" and the "Pearl." The "Peerless," an attractively designed table model, provides the facilities of a normal full-size cooker with a loading of nearly 4 kW, whereas its total loading is limited to 2.9 kW. Standard hob equipment comprises a grill boiler controlled by a three-heat switch and a boiling plate with "Simmerstat" control. The oven, which is heated by bottom elements and by the grill element, is thermostatically controlled by a "Revostat."



The Revo "Peerless" table cooker

When the grill boiler and the hotplate are used together in conjunction with the bottom oven elements, the loading on the grill boiler is automatically cut to 1 kW.

Taking up little space—its dimensions are 17¾ in. x 21 in. x 15½ in.—the "Peerless" has ample oven space with the addition of a plate-warming cupboard, and is of attractive appearance, being finished in black and cream vitreous enamel. Price with standard equipment is £14 2s. Extras include a 900 watt semi-radiant tubular-type boiling plate in place of the standard enclosed plate at 23s., and a special stand finished in cream enamel at 35s. If this is ordered separately it is subject to Purchase Tax of 9s. 4d.

Second only to the "Peerless" is the "Pearl" table cooker; this is a modified form of the "Peerless," providing a sound cooker at an exceptionally low price. It differs from its sister model in that it is not provided with the 6¼ in. boiling plate and the grill boiler is operated by a three-heat switch, a heat indicator in the oven door giving oven temperature. This model is available in the same finish at £10 10s. and again the special stand can be supplied as an extra. Further details can be found in leaflet 743/2/50, issued by the makers, Revo Electric Co., Ltd., of Tipton, Staffordshire.

Series 4 "Meggers" are Here

THE "Megger" insulation and continuity testers made by Evershed and Vignoles Ltd., of Acton Lane Works, Chiswick, London W.4, are so widely used in the electrical industry that their trade name tends to be used today as an accepted proper noun in the English language.

Bearing in mind this testimony to the accuracy and quality of these instruments it is pleasing to hear that a new series of instruments incorporating even more refinements is now available in this country.

Just introduced, the Series 4 range of "Megger" testers incorporate in a small and compact instrument, certain features hitherto only available in larger and more costly models.

They are housed in black plastic cases size 7¾ x 5 in. x 5¾ in., are light in weight, easily portable, are entirely self-contained and are fitted with spring terminals. The new series includes insulation, continuity, earth and earthometer testers.

The Series 4 insulation tester which has a scale range up to 50 megohms for testing at pressures up to 500 V, incorporates a constant pressure generator ensuring steady readings when testing cables having electrostatic capacitance or circuits fitted with suppressors, a refinement previously only available on the more expensive instruments in aluminium cases. The new tester can be fitted with a switch to divide scale readings by 100, or alternatively have a second scale for continuity readings of 0-100 or 0-10,000 ohms as specified when ordering. Other features also available at extra cost, include a live line detector to protect the instrument during continuity tests on live circuits, and a dial illuminating attachment, very advantageous when the instrument is used in indifferent light.

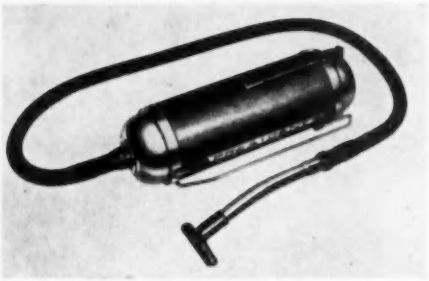
The "Megger" earth and earthometer testers

The Series 4 "Megger" earthometer tester

Series 4, are twin range instruments having scales of 0-40 and 0-200 ohms, or if preferred, 0-100 and 0-500 ohms. The earth tester determines the resistance to earth of earth electrodes, whilst the earthometer tester which has a live line detector and special switch, measures with safety the impedance of complete earthing circuits, including the resistance of the substation electrodes and those at the consumer's premises.

Bylock's "President" Offers New Deal to American Housewives

BEING shown at the Ideal Homes Exhibition for the first time in public is the "President" vacuum cleaner made by Bylock Electric Ltd., of South Street, Ponders End, Middx.



The Bylock "President" cleaner

Primarily intended for the overseas market, these cleaners are now being released in small quantities for home sales. The "President" has an attractive appearance, its modern design being certain to please.

Many of the already familiar "Bylock" labour-saving features are incorporated in this model, together with several entirely new features.

Control of the motor, which is rubber mounted for quiet operation, is by means of a toe-tap switch situated in the rear end handle fairing. The 78 in. of hose supplied has a specially designed coupling action; by inserting the hose and twisting to the right, a rubber seal ring is expanded, forming an airtight connection, whilst at the same time operating a spring lock which maintains secure connection.

Other interesting features include a swivel adapter which fits between the extension wands and the cleaning tool, permitting movement in all directions whilst maintaining a perfect suction seal. The extension wands themselves have a lock-tight fastening device. Weight of the cleaner is 17 lb. (without hose). The "President" is supplied with a complete set of tools which provide everything needed for cellar to attic household cleaning.

Developments in Switchgear

RECENTLY placed on the market by J. G. Statter and Co., Ltd., 82 Victoria Street, London S.W.1, is the Statter type "VL" metal-clad oil fuse switch with type "OD" isolators. This gear newly developed incorporates many up-to-date improvements and has been listed and proved for rating of 250 MVA at 6·6 and 11kV.

Salient features of the "VL" fuse switches and the type "OD" metal-clad non-automatic oil-immersed isolators include accommodation for a wide range of fuse ratings, suitability for incorporation in ring main tee-off switchboards, and "trips-all-phases" operation.

In general the "VL" switch has been designed to provide in conjunction with the type "OD" unit an economical equipment for use on supply systems between 3,300 V and 13,200 V. Designed basically to be suitable for either indoor or outdoor use in view of their weatherproof construction, the gear can, if desired, be supplied in a rust-proof finish. This gear is supplied in many combinations and alternative terminal arrangements, and will prove very suitable for use in rural supply systems, which call for great economy in expenditure, providing, as it does, an efficient and inexpensive means of control.

Brochure No. 555 lists and illustrates this gear the first production model of which was described in detail in the Electrical Times, 27 October, 1949.

The "Meter-Miser"

CLAIMED to be the simplest mechanical refrigerating compressor in the world, the "F-12" rotary unit is indeed an exceedingly simple machine. Known as the "Meter-Miser" for most apparent reasons, this unit is now being produced at the Hendon Works of Frigidaire Ltd. where it is being fitted in the company's latest household cabinet refrigerator, the R-4½.

In a new booklet produced by the company the step-by-step production of the unit is described and illustrated. Produced originally at the Dayton, Ohio, works of Frigidaire Ltd., the new Hendon-built units will not only be fitted into equipment distributed from the London works but will be available in several forms, as a compressor only, as an assembled condensing unit, or as a completely assembled sealed system with evaporator and electrical equipment.

Current production of this F-12 unit is for 210-240 voltage ranges, future production will include 115 volts. For 50 c/s supplies the unit is rated at 1/10th h.p. (1,450 r.p.m.), whilst for 60 c/s systems the rating is 1/8th h.p. (1,740 r.p.m.).

New Cooker by G.E.C.

IN our note under this heading last week we stated that in the new D.C.114 model, the hob had an extra boiling plate, this is not quite correct. In comparison with other two-plate patterns on the market today the G.E.C. Model D.C.114 affords the housewife extra facilities for easier cooking, but, of course, the predecessor of the new model, the D.C.113, was equipped with three boiling plates. Purchase tax does not apply to domestic electric cookers.

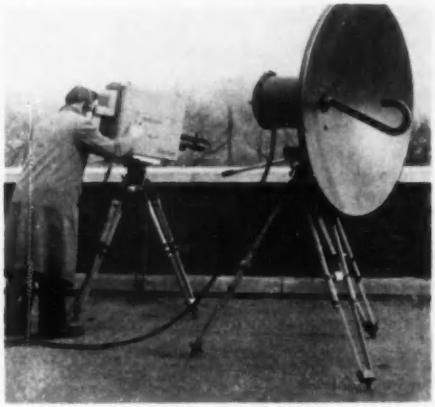
Focus on

THE BOAT RACE

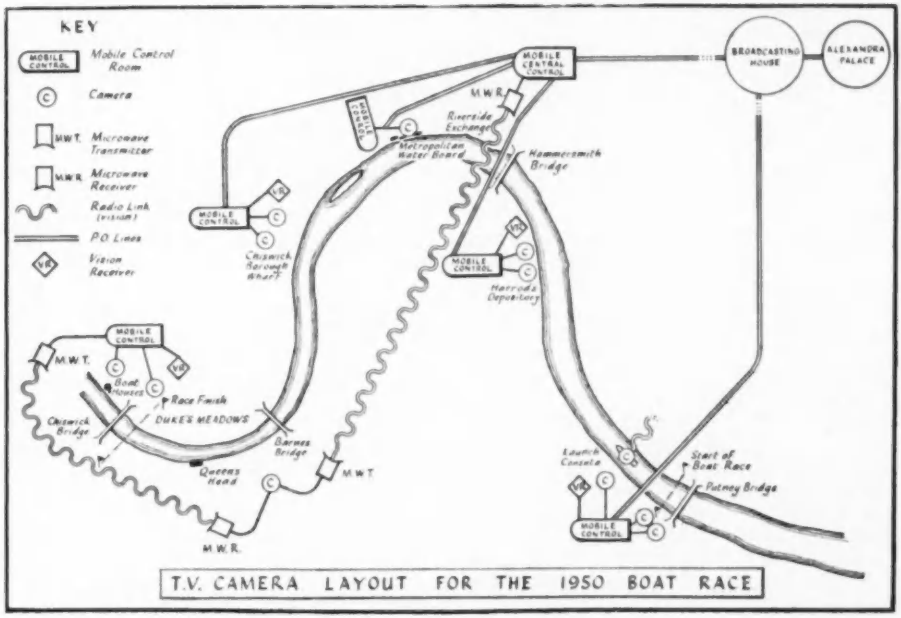
1950 Television plan uses special Microwave Radio Links

B.B.C. engineers have made elaborate arrangements for televising the Boat Race on Saturday, 1st April, and viewers can expect a more complete picture of the race than last year. Twelve television cameras of three different types—Electric and Musical Industries' CPS-Emitron, Marconi's Image Orthicon and the Pye Photicon—will be in action. Eleven of these are to be strategically placed along the course, with one camera in the launch *Consuta* following the crews.

Four mobile control rooms, including a new one from Pye Ltd., will be stationed at Putney Bridge, Harrod's Depository, Chiswick Borough Wharf and Chiswick Bridge. Additional control points with one camera each will operate from the Metropolitan Water Board station near Hammersmith Bridge and the Queen's Head, midway between Barnes and Chiswick Bridges. Except for Putney Bridge, vision signals from all mobile control points will be co-ordinated in the B.B.C.'s new mobile central control room parked near the G.P.O.

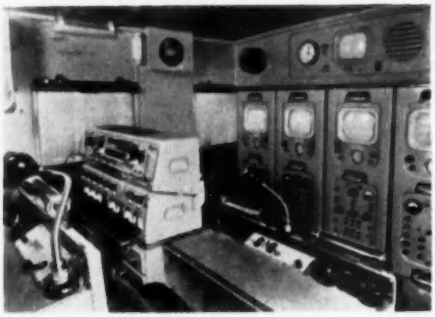


A Marconi microwave transmitter coupled to an Image Orthicon camera

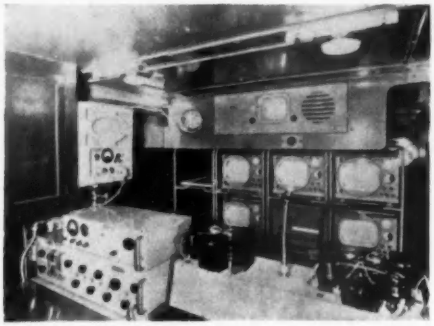


central control, near to riverside exchange.

Microwave radio links supplied by Marconi's Wireless Telegraph Co., Ltd., and Standard Telephones and Cables, Ltd., are being used for the first time. At the finish of the race the two links, connected in tandem, will transmit vision signals from the mobile control room at Chiswick Bridge to Queen's Head camera control position, from there to the central control room at Riverside Exchange.



Interior of the new mobile control room which Pye Ltd. have supplied to the B.B.C.



Sound and vision signals from mobile control rooms will be collated in this mobile unit built by Emitron Television Ltd.

Apparatus in the launch *Consuta* includes a Marconi camera in the bows, a Pye vision transmitter and v.h.f. equipment by Pye Telecommunications for the sound commentary. Power for this equipment will be generated by a petrol-electric set. As the launch moves down stream, both sound and vision signals will be picked up by the nearest mobile room for transmission to the central control room.

INSTITUTION'S N.W. SECTION JUBILEE DINNER

SOME three hundred and ten members and guests were present at the Midland Hotel, Manchester, last week, when the annual dinner of the I.E.E. North-Western Section was held under the chairmanship of Dr. C. Dannatt, O.B.E., D.SC. Following the loyal toast, "The Institution of Electrical Engineers" was proposed by Dr. O. Rhys Howell, B.SC., PH.D., D.SC., who spoke of the unique position occupied by the I.E.E. in that its voice was heard throughout the length and breadth of the globe. He offered his congratulations to the Centre on attaining its golden jubilee, and said that it was fitting that Manchester, which was the home of many firms of electrical engineers, should be the headquarters of the N.W. centre of the parent body. It was to be hoped that the rapid developments of the past 50 years would be surpassed in the next half century.

Responding, Professor E. B. Moullin, M.A., SC.D., expressed his appreciation of the knowledge gleaned from the centre in the two years he had spent in Manchester during the war. Professor Moullin continued: "No community can grow without a knowledge of its roots, and the N.W. centre has made an outstanding contribution by publication of 'The History of the N.W. Centre of the I.E.E.' By growth of industries during the last 50 years, the N.W. centre has been given many opportunities, and it would have been a disgrace had it not taken advantage of them. There must be no standing easy or resting on laurels. Professor Moullin concluded: "The past record of the N.W. centre has been good—the future must be even better."

In proposing "The City of Manchester," Mr. R. A. S. Thwaites, B.SC.(ENG.), spoke of the important part played by the city in the development of electricity, and the work carried out in the electrical industry by Manchester men. The Lord Mayor of Manchester, Alderman Robert Moss, J.P., replied and said that although Manchester had lost its undertakings, it had not lost its industry. No city in the world had made such progress in such a short time, and the position of Manchester in the world's trade and commerce was due to the electrical industry. The Lord Mayor hoped for an improvement in supply of generating plant and necessary equipment.

The chairman proposed "Our Guests," and welcomed three of the oldest members of the centre: Messrs. A. P. Wood, J. S. Peck and G. G. L. Preece. Professor H. Wright Baker, D.SC., responded.

THE WEEK in news

INDUSTRY COMMERCE

Investigations into Monopolies

ALTHOUGH the Monopolies and Restrictive Practices Commission have collected a great deal of information regarding allegedly restrictive practices in electric lamps, their findings have not been issued. Instead the first annual report, just published by the Board of Trade, is confined to dealing with the preliminary arrangements of the Commission which was set up in January, 1949.

The Board has already received several requests from the public to investigate restrictive practices, among them entry into the electrical accessories trade. Dynamos, starters and other electrical equipment for vehicles have been cited as an example where products are subject to a degree of monopolistic control. Offices of the Commission are at 37 Upper Brook Street, W.1.

For Better Street Lighting

STREET lighting engineers of County, Borough, Urban and Rural Councils are receiving personal invitations to attend a street lighting conference on April 5. To be held at the Midland Hotel, Temple Street, Birmingham, the conference has been arranged by the Lighting Service Bureau.

Beginning at 2.15 p.m., Mr. W. Robinson will discuss design of street lighting installations, followed by a talk on lamps and equipment by Mr. H. E. G. Watts. After tea, Mr. F. Jamieson will contrast the relative cost of different light sources for street lighting. The conference is not confined to street lighting engineers. Applications for seats should be made to F. Jamieson, Central England Area Engineer, 2 Ainsdale Road, Western Park, Leicester.

Pension Scheme Amendments

MODIFICATIONS to the present Electricity (Pension Scheme) Regulations are embodied in S.I, No. 359, which come into operation this week. They are, however, given retrospective effect from the date when the regulations amended came into operation. Under the new amendments, a whole-time member of an Electricity Board, who was subject to a scheme before becoming a member of the Board, or enjoyed pension rights preserved by the Electricity Act, 1947, or the Pension Rights Regulations, 1948, may, if he so desires, be treated as a whole-time employee of the Board for the purpose of the pension scheme. The 1948 Regulations are also amended in regard to transfer schemes, so as to allow transfer on payment by the trustees. Further, it is stipulated that in the case of persons who were subject to a dividend scheme, disputes regarding the pension regulations are to be referred to a referee appointed by the Minister of Labour. Certain other minor amendments are also made to clarify existing provisions.

Trade With Finland

DISCUSSIONS about Anglo-Finnish trade and balance of payments in 1950, which have been taking place between a Finnish trade delegation and U.K. Government officials, were successfully concluded in London last week. As a result the value of trade both ways in 1950 is expected to be considerably above last year's levels.

Imports from Finland consist largely of timber and newsprint, and a large proportion of Finland's exports to the U.K. are shortly to be freed from import licensing restrictions. U.K. exports to Finland cover a wide range of goods including textiles, chemicals, machinery products and other manufactured goods.

Largest Collier Launched

FIRST of six sister ships for the B.E.A., *Cliff Quay*, has just been launched by William Pickersgill and Son Ltd., of Sunderland. Of 4,600 tons d.w., the ship is the largest collier yet built for B.E.A., and besides the latest furnishings for the crew, electric cooking equipment is fitted. Launching ceremony was performed by Miss Margery Woodward, daughter of Lt.-Col. E. H. E. Woodward, a part-time member of the Central Authority.

The First Half-Century

The London County Council has earned an evil reputation for desiring to thrust its finger into every man's pie. One of the latest instances of its meddling activity is a representation to the Board of Trade that it is desirable that the maximum price chargeable by the Westminster Electric Supply Corporation be reduced from 8d. to 5d.; this step being taken in the interests of the few recalcitrant customers who refuse to accept service at 200 volts, thereby putting the Supply Corporation to great expense and inconvenience.—*From our issue March* 22, 1900.

Electric Crematorium Extension

AN EXTENSION to the Corporation's electric crematorium has been recommended by the Croydon Parks, Cemeteries and Small Holdings Committee, who report that for some time the existing two furnaces have been working to capacity. The number of cremations has more than doubled since 1944, the total last year being 1,517. It is now proposed to install a further two electric furnaces, with ancillaries, at an estimated cost of £9,200, and erect a suitable building to house the plant, transformer and switchgear, at a cost of £15,000. The committee has recommended that an order be placed with Birlec Ltd., for the latest type of furnace.

New Motor Aids Dollar Drive

CANADIAN press correspondents over here on a production tour were shown a prototype of a new Brook electric motor when they visited the Huddersfield factory last week. Designed to N.E.M.A. standards and C.S.A. approved, the new motor can be incorporated in British machines intended for sale in the American market. Full production is expected in about three months.

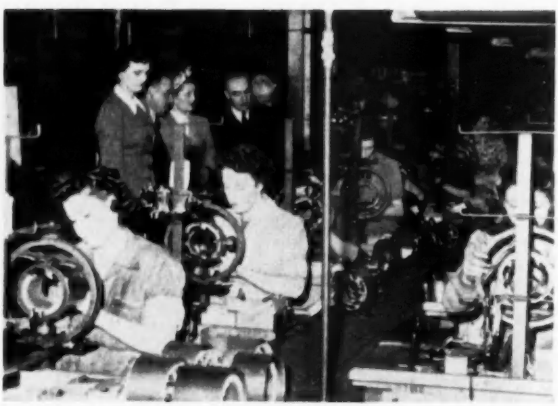
After reception by the directors of Brook Motors Ltd., the seven Canadians were shown over the works. Mr. Frank V. Brook, managing director, told them that although export markets were difficult in other Commonwealth countries, Canada promised to be a good customer. Already a continuous order had been received from a leading oil company in the new Canadian oil area in Alberta.

I.E.E. Students' Dinner

SOME eighty members of the I.E.E. London Students' Section, with their guests, attended last Friday's annual dinner of the section, the first to be held since the war. Mr. P. W. Castle, the section chairman, presided, and the principal guest was Mr. P. V. Hunter, C.B.E., a past president of the Institution. The latter, responding to the toast of "The Institution," proposed by Mr. P. D. Atkinson, M.A., the Hon. Secretary of the Section, recalled his early days in the London Students' Section, at the beginning of the century. As an illustration of the progress of the profession in the intervening years, he pointed out that in 1900 radio-activity was effectively unknown, three-day fogs were common in London—and the attendance at the section dinner (an informal function) was 12.

The toast of "Our Guests" was proposed by the section vice-chairman, Mr. I. J. Shelley, and replied to by Dr. J. A. Saxton, B.Sc., the Council's representative on the Section Committee. Finally, in the formal proceedings, came the toast of "The London Students' Section," proposed by Mr. J. H. Reyner, B.Sc., and the reply by Mr. Castle. The chairman dwelt on the advantage of the Students' Section as a training ground for full participation in Institution activities, and called for more support from its 3,500 members.

Because the floor is used for marking out in coloured chalks, blended lighting was installed in the Darlington Railway Plant and Foundry Co's rail bending shop. Each Metrovick reflector contains a 400-watt discharge lamp and a 500-watt gasfilled lamp



In the fractional h.p. motor department of Brook Motors Ltd., interested Canadian press correspondents watch motor assembly

G.E.C. Present "Playbill"

TERENCE RATTIGAN'S *Playbill*, presented by the G.E.C. Dramatic Society at the Fortune Theatre last week, had all the polish which one has grown to expect from this Society's productions. In the first play, *The Browning Version*, John Hurst gave an outstanding performance as Andrew Crocker-Harris.

Scene from G.E.C. Dramatic Society's latest production, "Harlequinade"

The second play, *Harlequinade*, is a riotously funny study of a dress rehearsal with many unrehearsed incidents, and was notable for the remarkable teamwork displayed by the cast. William Peacock thoroughly enjoyed himself in his portrayal of Arthur Gosport, a flamboyant, Barrymore-ish, larger-than-life caricature of an actor-manager, in which he was ably assisted by Cecilia Ridler, as his equally eccentric wife. Others who contributed to the success were Ian Stewart, Norah Symonds, Ronald Turner, Norman Waite, Michael Molloy, Richard Anson, Jean Freeman, Florence Scantlebury, Keith Clifton, Dudley Binnington, Evelyn Rush and Leslie Abraham.

Electricity in the Yorkshire Coalfield

NATIONAL Coal Board plans for the reorganisation of collieries in the Rotherham area now in hand involve the installation of a large winder driven by a 3,500 h.p., 3 kV a.c. synohronous motor, connected to drive two 1,250 kW 600 V generator sets which in turn supply two 1,750 h.p. a.c. motors driving the winder drum. Six other winders are being electrified, and one of these, like that described above, is at the Manvers Main Colliery. These two make possible the sudden imposition of 4,800 h.p. load on the Yorkshire Electricity Board system. A coal preparation plant at the same colliery will involve another 7,000 h.p. of installed electric motors.

To provide a supply, a 66 kV substation is being erected locally to give an 11,000 kVA supply to Manvers Main. Further colliery electrification in the area will bring the total extra demand up to 20,500 kVA. A further 6,000 kVA of load may result from coke oven extensions.

Sign Manufacturers' Successful Year

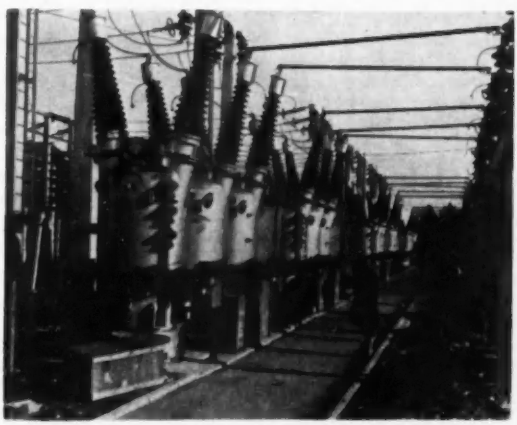
"THE PAST year has been the most important in the history of the electrical sign industry," the chairman of the Electrical Sign Manufacturers' Association, Mr. A. E. Beadnell, told members at the annual general meeting and luncheon at the Café Royal, London.

Mr. Beadnell went on to refer to the efforts of the Association which succeeded in releasing the industry from the "black-out" ban on illuminated signs. He paid tribute to the work being done by Mr. S. D. Moyse and Mr. G. S. Campbell on the Outdoor Advertising Industry Advisory Committee to protect the interests of members and the industry in the sphere of town and country planning.

The meeting unanimously approved the annual report for 1949, and the secretary, Mr. Bernard Moss, was congratulated on the way the report had been prepared. Mr. Beadnell (Elders, Walker and Co. Ltd.) and Mr. G. S. Campbell (Franco-British Electrical Co. Ltd.) continue as chairman and vice-chairman respectively for 1950.

January Radio Sales Drop

FOR THE month of January, R.T.R.A. sales index shows a drop in sales of radio sets, which is not surprising considering the high level of sales before Christmas. Television sales also dropped. The percentage of radiograms sold was higher



Soon to come into operation—a line of 132 kV circuit-breakers at Errochty switching station, N. of Scotland H.E. Board

Housewives were intrigued by the automatic cooker featured on N.W. Board's stand at Manchester "Brighter Homes" exhibition

than at any time during the previous twelve months. Average number of sets sold per shop in January: Radio, 11·94 compared to 11·79 last year; television, 9·09 compared to 5·68.

Power Conference Still Open

APPLICATIONS for membership of this year's World Power Conference (previewed in our 15th December issue) can still be received, says the general secretary, Mr. C. H. Gray. The conference is to be held in London from 10th to 15th July. Requests for admission should be forwarded to the offices of the Fourth World Conference, 414 Cecil Chambers, 76 Strand, W.C.2.

Hot Water in the Home

EIGHTH REPORT in the "National Building Studies" series, *An Inquiry into Domestic Hot-water Supply in Great Britain*, was published on Tuesday by the Stationery Office, price 1s. The report is the result of a survey undertaken by a working group under the chairmanship of Dr. F. Yates at the instance of the scientific advisory committee of the Ministry of Works.

Based on investigations carried out in nearly 6,000 representative households during the severe winter of 1947, the conclusions show that 46% of the households had baths and a further 8% shared baths; 31% had only a portable bath; 12% had no bath; in Scotland the proportion was 35%.

Of fuels used for water heating, the survey gives the following table:—

No. of Households in Survey	5,997
Water heating appliances using:—	Percentage
Solid fuel only	40
Gas only	17
Electricity only	2
Solid fuel and gas	17
Solid fuel and electricity	5
Gas and electricity	1
All three	2
No water heating appliance	15
No hot water laid on	1

An Animated Cooker

OUTSTANDING feature of N.W. Board's stand—a popular attraction at the current Brighter Homes Exhibition in Manchester City Hall—is an animated cooker, produced by the Board's publicity section to draw attention to the main points of a modern electric cooker.

The hob rises and falls, while the griller is brought into view by the movement of the griller door. The oven door opens automatically and the warming drawer at the base of the cooker slides in and out. The cooker is of no particular make but is a hybrid combining the advantages of modern types. The exhibition closes on Saturday.

Half Century with One Firm

TWO WIRING engineers, who were carrying out installations when wood casing was the order of the day, were among six senior charge hands recently presented with gold watches by the directors of Green and Smith Ltd., Leeds. The presentations were made by a director, Mr. J. D. Green, to Mr. Joseph W. Robinson (51 years) and Mr. Charles Ruddick (50 years) at a whist drive and dance organised by the firm's welfare society and held in the Star and Garter Hotel, Kirkstall, Leeds. Other recipients of watches were Messrs. Sydney S. Smith (40 years), Clifford O. Jones (40 years), Harold Shepherd (29 years) and Walter J. Carter (23 years). Among the 180 employees and guests were two other directors, Mr. J. G. Craven and Mr. J. R. Buck.

News in Brief

The first 60 MW turbo-generator at Staythorpe power station, near Newark, Notts, was put into operation last week-end.

Just published by Unipede, the report of the 8th Congress of the International Union of Producers and Distributors of Electricity, held in Brussels last September, presents 85 papers in two volumes of 800 pages each. Price is 8,000 Fr. francs.

Representatives from provincial branches of the Reliance Telephone Co. Ltd., travelled to the Horseshoe Hotel, Tottenham Court Road, London, for the recent annual London Engineers' dinner and smoking concert. The chairman, Mr. E. Silbermann (managing director), was assisted by Mr. V. Amberg and Mr. W. T. Ashton, members of the Board.

Important part of model making in industry will be featured at the Jubilee Model Engineer exhibition at the New Horticultural Hall, Westminster, from August 9 to 19.

Raw materials of the iron and steel industry are outlined in Booklet No. 1 of the Raw Material Survey series the Purchasing Officers' Association are now publishing.

Cases in Court

Payment for Work Done

IN the Bristol County Court recently, H. Tanner & Co., electrical engineers and contractors, of Bristol, claimed the sum of £472 from Mr. R. H. Moloney, exhibition contractor, for work done and materials supplied in September, 1949, in connection with the Bristol Ideal Home, Industrial and Fashion Exhibition. Plaintiffs' case was that a charge of £750 was made for the work, the balance outstanding being £472. He said that prior to the Bristol show, certain things came to his knowledge relating to Moloney Productions, Ltd., and Moloney told him he would get paid personally by him. Mr. Tanner denied signing a proxy for a meeting of creditors of Moloney Productions, Ltd.—the proxy was later cancelled. Mr. Moloney denied indebtedness, contending that the plaintiffs had dealt with Moloney Productions, Ltd.—now in liquidation. It was further pleaded that there was a contract price with H. Tanner & Co. for the work of £500, of which £278 had been paid, the remaining £222 being due from the company, and not the defendant. Summing up, Judge Wethered said where people did not know enough about the machinery of forming a limited liability company, they were invariably hurt, and he considered that had happened in this case. The importance attributed to the word "limited" was significant. He gave judgment for the defendant, with costs.

Work Without a Licence

William Hill, turf accountant, and William Hill (Park Lane), Ltd., were each fined £500 with £50 costs in the Central Criminal Court recently, for permitting construction work exceeding £100 without a licence from the Minister of Work. The work was in connection with electrical installations at the company's premises in Haymarket, which were believed to have cost at least £2,000. For the defendants it was said that after temporary electric wiring had been done at Hill House, the electricity undertaking wrote saying the premises would have to be rewired. Originally there was talk of obtaining a licence for £4,000 and Mr. Hill thought he was dealing with a £4,000 estimate.

Questions in Parliament

Telegraph (Money) Bill

Moving the second reading of the Post Office and Telegraph (Money) Bill, Mr. Ness Edwards, Postmaster-General, said it would enable the P.O. to undertake £75,000,000 of capital development to meet requirements until October, 1952. The greater part of the capital required was for telecommunications, particularly telephones. At the end of 1949 there were 480,000 people waiting for the telephone, due to shortage of materials, including tin and copper; and the waiting list was still growing. Potential demands would require a capital expenditure of £300 million.

Telephones installed in this country numbered 832,000 in 1946, 711,000 in 1947, 674,000 in 1948 and 720,000 in 1949.

Regarding television, he said that present developments should ensure that within a little more than two years the service would be made available to about 70% of the population of Britain. The target was 80% by the end of 1954. It was hoped that the Holme Moss station now under construction would be opened by the middle of 1951. A site had been approved for a Scottish station, which it was hoped would be open by the end of 1951, and the B.B.C. were now searching for a site for a Welsh station, which it was planned to open during 1952.

Sir Herbert Williams asserted that there was no longer a shortage of tin, copper or rubber. He was taken up by Mr. J. Lewis, who stressed that tin and copper were not the only commodities involved in cable manufacture. In the cable industry at the present moment a long time elapsed before delivery was effected. Joining in, Mr. Erroll disagreed with Mr. Lewis, saying that there was no shortage of telephone cables in this country now. In fact some companies were working short time.

University Grants (Technology)

Mr. Higgs asked the Chancellor of the Exchequer what grants in aid were at present provided to assist Universities in setting up post-graduate schools in various branches of technology. Replying, Sir Stafford Cripps explained that, at the suggestion of the University Grants Committee, several Universities were instituting or expanding such courses of advanced instruction in technological subjects. These were intended mainly for graduates who had already spent a few years in industry, the subjects including the three main branches of engineering, metallurgy, mining and chemical engineering. Other courses were under consideration. To meet the cost, additional recurrent grants had so far been promised amounting to £15,500 for 1949-50, £42,000 for 1950-51, and £57,000 for 1951-52.

Compensation to Municipalities

When questioned by Mr. Black, the Minister of Fuel and Power, Mr. P. Noel-Baker, said he hoped soon to publish the regulations governing the payment to local authorities, who, prior to nationalisation, were electricity undertakers, in regard to the amounts they would receive as compensation for loss or severance out of the sum of £5,000,000 provided for the purpose. He was still waiting the views of some of the local authority associations about the proposal.

Electric Supply——— News

Brighton and Hove

The local Chamber of Commerce is to seek the help of the National Chamber of Trade in obtaining agreement from the British Electricity Authority for the return of the pre-war preferential tariff for shop window lighting and displays.

Colyton

Discussions have been going on regarding the purchase of the local electricity undertaking (owned by Hann and Sons) by the South-Western Electricity Board. It was reported at the recent meeting of the Parish Council that the Board had made an offer which Hann and Sons could not accept. Anxious that the negotiations should be brought to a successful conclusion, the Council has decided to suggest to the Area Electricity Consultative Committee that the Board and Messrs. Hann and Sons should refer to arbitration the question of price which should be paid for the undertaking.

Douglas (I.O.M.)

Some of the difficulties confronting the electricity undertaking were explained at the recent meeting of the Town Council when the recommendations of the Finance Committee were discussed. Although the approximate surplus for the year was £8,459, there was the cost of the d.c. to a.c. change-over work to face in addition to a loss of £80,000 p.a. which was expected when the Isle of Man Electricity Board begins to generate its own requirements. During the current year this represented more than a third of the total income. The Electricity Committee had considered proposals for minimising the loss, so that the future of the undertaking was not jeopardised. Concentrating on avoiding any increase in tariffs, an intensive drive is to be made to obtain additional load in the Corporation's area.

The Council approved the carrying out of extensions to the Onchan network at a cost of £6,500. The borough electrical engineer is also to report on a long-term plan for the improvement of street lighting.

Plymouth

Work was proceeding last week on the laying of a 33 kV cable across the Tamar, from Plymouth to Saltash. The cable will carry on to Callington, where it joins the existing 33 kV ring serving south-east Cornwall. The scheme, of which the laying of the river cable forms part, also provides for the establishment of a substation at Whity Cross.

Retford

At the recent meeting of the town council it was agreed to pay, under protest, the sum of £17,588 over to the B.E.A. This followed consideration of a further communication from the Ministry of Fuel and Power explaining that the Minister had no power to intervene. According to some members it was felt that the sum should have gone into the borough rate fund for the benefit of rate-payers.

Scotland

Close on the heels of the Merseyside and N. Wales Electricity Board, further rebates to consumers whose accounts were subject to the Clow surcharge during the winter of 1948-49, are now announced by the South West Scotland Board and the South East Scotland Board. In the case of the South West Scotland Board, the rebate on the unit charge is 0·2d. p.u., during the quarter following the first meter reading after April 15. The rebate to be given by the South East Scotland Board is 0·1d. p.u. during the summer quarter.

Southern Bd.

It was reported at a recent meeting of the Swindon Chamber of Commerce that the Southern Electricity Board had agreed to charge traders at a reduced rate for shop window lighting after 6 p.m., provided the traders did not remain open after that hour.

S.-Western Bd.

The South-Western Board should be urged to make intensive efforts to increase the industrial load, it was resolved at the recent meeting of the area consultative council. Mr. H. C. Rogers, of Bristol, considered that the Board was not getting around enough to industrialists, particularly the smaller firms, to stress the ways of using electricity off peak and thereby increasing revenue.

LIGHTING SCHEMES

Horbury.—U.D.C. is preparing a scheme for conversion from gas to mercury vapour lighting of two miles of the main Wakefield-Huddersfield road.

Leamington Spa.—The Highways and Town Planning Committee has recommended the installation of fluorescent lighting on main roads, at a cost of £23,450, and a complete new electrical installation, including concrete columns, at an estimated cost of £27,373.

Newtownards.—The Borough Council has agreed to the installation of 240 W fluorescent lanterns on single- and double-arm columns on various main roads, approximately 53-125 W mercury vapour lanterns in other streets, and 80 W metal filament in certain other streets. Tenders are to be invited for the work.

Redcar.—The Entertainments Committee has approved a £12,078 scheme for illuminations at the Coatham Enclosure, the Esplanade to the pier and other strip lighting.

Rutherglen.—A scheme for conversion of street lighting to electricity is being submitted to the T.C. by the South-West Scotland Electricity Board. When the town itself considered introducing electric street lighting, the cost was in the region of £70,000.

Skegness.—Six contractors have submitted schemes for providing illuminations at the boating lake next season.

Skipton.—The U.D.C. has proposed a scheme for converting gas lamps to electricity, at an estimated cost of £10,000.

Southport.—A new scheme of permanent illuminations for the South Marine Gardens is to be submitted to the Town Council. Estimated cost is £3,600.

Strabane.—The U.D.C. has adopted a scheme for the public lighting of the town by electricity at a cost of £3,500.

Sunderland.—The T.C. has agreed to employ R. W. Gregory and Partners to prepare specifications for the replacement of gas lighting by electricity in a number of schools, at the standard fee of 6%, plus expenses.

Tewkesbury.—The M.o.T. has agreed in principle to the conversion from gas to electric lighting on trunk road A.38. The Council's General Purposes Committee disagrees with the proposal to install 400-watt mercury-vapour lamps, however.

Trowbridge.—Application is being made to the Minister of Health for consent to borrow £4,000 for extending electric street lighting, and a further £790 for 34 lamps at Studley Green estate.

Wigan.—The T.C. is to apply for consent to borrow £5,330 for converting street lighting from Group "B" to Group "A" standard on various roads in the borough.

Company Activities

British Columbia Power Corpn. Ltd.

Gross revenue from operations during 1949 amounted to $39,632,303. Operation and maintenance, including property taxes absorb $24,995,176, legal fees and executive remuneration $176,978, directors' fees $22,150, provision for accidents $447,090, pension contributions $944,868, depreciation $4,724,453, income tax $2,248,980, leaving income of $6,072,608 plus $145,028 other income. Bond debt interest $2,601,602, bond discount and refunding and issue expenses written off $212,686, leaving net income $3,403,348. Dividends take $1,100,090, to which is added $2,418,331 brought in, $600,000 taxation reserve not required and $1,150,000 recoverable from E.P.T. Expenses on issue of 4¾% Cumulative Preferred shares and Class "A" shares, etc. $371,209, dividends on Class "A" shares of parent company $1,696,000, leaving $4,404,380 carried forward.

Cambridge Instrument Co.

The directors propose to capitalise £255,452 from reserves by means of a bonus issue to Ordinary shareholders to be distributed in the proportion of one new Ordinary share of £1 for each £1 share held. An extraordinary general meeting has been called for March 31. The report for 1949, recently issued, included a note to the effect that the additions to buildings and plant and other permanent assets made since 1945 should be reflected in the company's share capital.

Midland Electric Manfg. Co.

The full accounts show a trading profit for 1949 of £287,959 (*£287,585*), plus other income £2,747 (*£2,529*), making £290,706 (*£290,114*). To depreciation £15,001 (*£14,895*), directors' remuneration £18,572 (*£17,366*), audit fee £623 (*£641*), taxation £138,619 (*£141,473*), leaving a net profit of £117,891 (*£115,739*). To share issue expenses £1,790 (*nil*), reserve replacement of fixed assets nil (*£8,783*), stock reserve £25,000 (*same*), general reserve £60,000 (*£45,000*), Preference dividend £3,094 (*same*), Ordinary dividend 12½% on increased capital £30,938 (*£28,875*), leaving £54,664 (*£45,109*) carried forward.

M. Mole & Son

Trading profit for 1949 was £20,675 (*£31,100*). Net profit after tax and other charges is £7,755 (*£13,716*), plus £1,291 (*nil*), E.P.T. refund on deferred repairs claims, and tax provision no longer required £465 (*£222*). With £10,205 (*£11,284*) brought in, there is £19,716 (*£28,955*) available. To general reserve £3,500 (*£5,000*), dividend 10% (20% and bonus 5%) £5,500 (*£13,750*), leaving £10,716 carried forward.

R. B. Pullin & Co.

Group profit for year to September 30, was £57,819 (*loss £8,291*), including £39,537 (*£1,715*) special credits, and after all charges, including taxation £21,038 (*£16,330*). Dividend 10% same.

Thomas Bolton and Sons

Preliminary details show a trading profit for 1949 of £434,597 (*£284,853 for nine months*). Final dividend is 7½%, making 10% (7½% *for 9 months*). To depreciation £73,446 (*£50,005*), tax £172,395 (*£135,656*), underwriting commission written off £13,500 (*£110*), reserve for possible future losses on stock £20,000 (*nil*), to general reserve £40,000 (*£29,000*), leaving £130,869 (*£110,576*) carried forward.

Thorn & Hoddle Ltd.

For the year to September 30 last, there was a net profit of £1,713 (*£2,545*) after providing £2,087 (*£1,950*) for taxation, etc. Off goodwill £1,000 (*same*), to employees' benevolent reserve nil (*£250*), Preference dividend £395 (*same*), Ordinary dividend 10% £550 (*same*), leaving £6,975 (*£7,207*) carried forward.

Watford Electrical and Manfg. Co.

Preliminary details show a net profit for 1949, before tax, of £38,936 (*£38,190*). There is a final dividend of 10% and bonus of 5% (*both same*), making 20% (*same*) for the year.

Commercial Information

CONTRACTS OPEN

HOME

Mar. 25.—Airdrie T.C. Twelve months' supply of electric lamps. J. Taylor, Town Clerk, 51 Wellwynd, Airdrie.

Mar. 25.—Dublin T.C. Provision and installation of an electric passenger lift at City Hall. City Treasurer, Exchange Buildings, Lord Edward St. Deposit £1 1s.

Mar. 27.—Chatham T.C. Complete rewiring of electrical installation of Elm House, New Road Avenue. H. D. Peake, Borough Engineer and Surveyor, Town Hall, Chatham. Deposit £1 1s.

Mar. 27.—Derby T.C. Electric lamps and batteries for year ending 30th April, 1951. M. L. Francis, Borough Engineer and Surveyor, Council House, Derby.

Mar. 27.—Dundee T.C. Electric light installation at Linlathen Infants' School and St. Vincent's Infants' School (both aluminium). City Quantity Surveyor, 21 City Square, Dundee.

Mar. 28.—Coleraine. Electrical installation at Chest Clinic for N.I. Tuberculosis Authority. William Harvey, Secretary, 27 Adelaide Street, Belfast. Deposit £2 2s.

Mar. 29.—Angus C.C. Supply and erection of columns, brackets and fittings for public lighting at Newtyle. County Engineer, County Buildings, Forfar.

Mar. 29.—Hastings T.C. Electrical installations for junior and infants schools and kitchen dining unit at Parker Rd., Hastings. Unity Structures Ltd., 35 Tavistock Square, W.C.1. (See our March 9 issue.)

Mar. 31.—Belfast T.C. (1) Fire resisting doors, (2) phosphate dosing equipment for boiler feed water treatment and (3) relay testing equipment. Electricity Dept., East Bridge St., Belfast. (See our March 9 issue.)

Mar. 31.—Manchester T.C. Electrical installation for new primary school at Wythenshawe. City architect, Town Hall, Manchester. Deposit £1 1s. (See our March 9 issue.)

Apr. 3.—Barrhead. Erection of poles, brackets, etc. in connection with improvement to existing street lighting. Burgh Surveyor, Municipal Offices, Barrhead.

Apr. 3.—Hucknall U.D.C. Electric wiring and installation at waterworks pumping station, Salterford, nr. Calverton, Notts. Surveyor, Council Offices, Watnall Rd., Hucknall.

Apr. 4.—Blackpool.—Electrical installation at Technical College Refectory, Hornby Road. Borough surveyor, A. Hamilton, Municipal Buildings, Blackpool. Deposit £2.

Apr. 6.—Harwich T.C. Electrical installations in 36 houses at Grange housing site. Borough Architect, King's Quay Street, Harwich. Deposit £2 2s.

Apr. 7.—Blaydon U.D.C. Electric fittings and cable to be delivered at Neighbourhood unit housing site, Litchfield Lane, Winlaton, Blaydon - on - Tyne. Housing Surveyor, Council Offices, Blaydon-on-Tyne.

Apr. 14.—Belfast T.C. Renewal and re-adjustment of 33 kV, 750 MVA and 500 MVA switchgear and accessories for existing Reyrolle switchgear. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (See our Mar. 16 issue.)

Apr. 15.—Manchester T.C. Repairs to electrical installation after war damage at Burnage High School for Boys, Levenshulme. City Architect, Town Hall, Manchester. Deposit £1 1s. (See our Mar. 16 issue.)

Apr. 18.—Kingsclere and Whitchurch R.D.C. Electrically driven booster pump for Ashmansworth pumping station. Council's Surveyor, R. A. Over, Council Offices, Kingsclere, Berks.

Apr. 20.—Lockerbie T.C. Provision of street lighting on trunk road A74, comprising erection of 47 columns, brackets, lanterns and 140 watt sodium electric discharge lamps. G. Stevenson, Town Clerk, Town Hall, Lockerbie. Deposit £2 2s. (Advertised in this issue.)

Apr. 28.—Belfast T.C. 6,600 V and 400 V auxiliary switchgear and accessories for Harbour power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (Advertised in this issue.)

Apr. 28.—Manchester. New electrically operated passenger lift for College of Technology. The Chairman, College of TechnologyS ub-committee, Education Offices, Deansgate Manchester 2.

No date stated.—Carlton U.D.C. Electrical installations for 58 houses at Valley Road and 20 flats at Cavendish Road. J. R. Campbell, engineer and surveyer, Council House, Burton Road, Carlton. Deposit £1 1s. (Applications by Mar. 31.)

No date stated.—Lancs C.C. Electrical installation at Farnworth Grammar school. County architect, G. Noel Hill, County Offices, Preston. Deposit £2. (Applications by Mar. 27.)

No date stated.—Lancs. C.C. Renewal of electrical installation at Crosby Road North junior and infant county school, Crosby. County Architect, G. Noel Hill, County Offices, Preston. Deposit £2. (Applications by Mar. 27.)

No date stated.—North Riding. Installation of electrical services at South Eston central kitchen and Skelton and Brotton Lingdale county school dining centre. County Architect, County Hall, Northallerton.

No date issued.—Swansea T.C Electrical installation at new grammar school at Sketty, Swansea. Borough Architect, The Guildhall, Swansea. Deposit £2. Applications by April 1. (See our Mar. 16 issue.)

No date stated.—N. Scotland H.E. Board. Wood pole transmission and distribution lines to be constructed in Ullapool/Lochinver district, Ross and Cromarty. Engineers, Strain and Robertson, 154 West George Street, Glasgow. Deposit £2 2s. (Applications by Mar. 31.) (Advertised in this issue.)

No date stated.—Newcastle-on-Tyne T.C. Electrical installation in new canteen being built in basement of Central Police Headquarters. City Architect 18 Cloth Market, Newcastle-on-Tyne.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Mar. 29.—Belgium. Electrical equipment for signalling installations. Societe Nationale des Chemins de Fer Belges, Direction de l' Electricite et de la Signalisation (Bureau 72-23), 17 rue de Louvain, Brussels (B.o.T. (Ref. CRE (IB) 46822/50)*

Mar. 29.—Belgium. Substation transformers for main signal lights, speed indicators, ground signals, main transformer rectifiers, current transformers for main signals, battery charging transformer rectifiers and insulation transformers. Belgian State Railways, Hotel des Chemins de Fer, Sous-sols, Salle B, 17 rue de Louvain, Bruxelles. B.o.T. (Ref. CRE (IB) 46564/50).*

Mar. 29.—Belgium. Various lengths of waterproof corrosion-resisting cables, types CHB, and CHab. Ministry of Telegraphs and Telephones, Brussels.

Apr. 3.—Thailand. Two diesel engines and two 3-phase synchronous alternators for Udorn Thani power station. Director General, Department of Public and Municipal Works, Bangkok. B.o.T. (Ref. CRE (IB) 5184/50).*

Apr. 4.—S. Africa. 6 miles 19/·064 (·06) and 3 miles 19/·083 (·1) varnished cambric insulated hard drawn copper-stranded conductor in ½ mile drums. City Electrical Engineer, 3rd floor, Electricity House, Strand Street, Cape Town. B.o.T. (Ref. CRE (IB) 45819/50).*

Apr. 6.—S. Africa. One million paper sleeves for 10 lb. conductor cable 120° to specification Union No. 694. Chairman, Union Tender Board and Supplies Office, 271 Visagie Street, (P.O. Box 371) Pretoria. B.o.T. (Ref. CRE (IB) 45630/50)*.

Apr. 7.—Southern Rhodesia. Medium power X-ray plant, including: an h.t. generator capable of supplying 200 MA at 65 kVp and accessories. Southern Rhodesia Government, Salisbury. B.o.T. (Ref. CRE (IB) 46903/50)*.

Apr. 10.—Brazil. Supply and erection of mechanical and electrical equipment for a steam power station of 20,000 kW at Candiota, Minicipio de Bage, State of Rio Grande de Sul. Director General, Nationa Railway Dept., B.o.T. (Ref. CRE (IB) 35426/49).*

Apr. 10.—Thailand. One diesel engine with 3-phase synchronous alternator for Uttardit, power station. Director General, Department of Public and Municipal Works, Bangkok. B.o.T. (Ref. CRE (IB) 45184/50).*

Apr. 11.—Canada. Two horizontal and two vertical shaft generators for Clowhorn Falls development, British Columbia. B.o.T. (Ref. CRE (IB) 45020/50).*

Apr. 12.—Australia. 6,600 V switchgear fuses and lightning arresters for Mackay City Council. Specification No. 183. 6,600 V armoured cable and outdoor type cable boxes. Specification No. 182, State Electricity Commission, Brisbane.

Apr. 13.—Uruguay. Two private branch automatic exchanges and telephones. Administracion Nacional de Combustibles Alcohol y Portland. B.o.T. (Ref. CRE (IB) 46077/50).*

Apr. 14.—New Zealand.—Voltmeters, ammeters, microammeters and milliameters. New Zealand Post and Telegraph Department. Director-General (Stores Division), General Post Office, Wellington, C.I.

Apr. 14.—S. Africa. Distribution equipment for specification No. 1,1949. Consulting Engineer, J. S. Clinton, P.O. Box 4648, Johannesburg. Deposit £3 3s.

Apr. 15.—Syria. Various types of underground telephone cables. Director-General of the Syrian Posts, Telegraphs and Telephones, Damascus. B.o.T. (Ref. CRE (IB) 46341/50).*

Apr. 25.—Greece. Telephone equipment and cables and wireless transmitters. Ministry of Post, Telegraphs and Telephones, Athens. B.o.T. (Ref. CRE (IB) 43996/50).*

Apr. 25.—Portugal. Equipment for Lisbon central mills pasteurising station, including refrigerating plant and power plant, with switchboard. Lisbon Municipal Council. B.o.T. (Ref. CRE (IB) 44147/50).*

Apr. 27.—Australia. 11,000 V, 250 MVA metal-clad switchgear for Mascot sub-station. Specification 1363. Deposit £150. Comptroller of Stores, Old Electricity Building, St. Andrew's Place.

May 3.—Australia. One 750 h.p. crude oil engine and alternator for Charters Towers, Queensland. Offices of State Electricity Commission, Scottish Union House, Eagle Street, Brisbane. B.o.T. (Reg. CRE IB) 45242/50).*

Your Queries — Answered

"Plus-ten" soldering iron, makers of? T.E.—Coxhead's Stratford Foundry Ltd., 15 Martin St., E.15. (17819)

"Senco" potato mashing machines, makers of? T.E.—Saml. Nye and Co., 63a St. George's Rd., S.E.15. (17825)

"B.T.E." fractional h.p. motors, makers of? T.E.—B.T.E. (Bradford) Ltd., Wakefield Rd., Bradford, (17829)

"Safeways" adaptors, makers of? S.W.—British Mechanical Productions Ltd., 21 Bruton St., London W.1. (17832)

"Erco" iron, makers of? T.E.—E.R. Co., Elliott Wks, Elliott Rd., Bromley. (17835)

"Simpsons" turntables, makers of? T.E.—Kingsway Electricals (1938) Ltd., Kingswood Works, Station Rd., Pitsea, Essex. (17839)

"Airway" vacuum cleaners, agent for? T.E.—Airway Cleaners, 247 Neasden Lane, London N.W.10. (17845)

"Falcon Forge" fittings, makers of? T.E.—Thomas Heywood and Sons Ltd., Coulsdon, Surrey. (17849)

Egg poachers, electrically heated, makers of? S.E.—David Griffin Ltd., 39 Wimborne Rd., Poole, Dorset. (17852)

The above are selected from questions we have answered this week. If you have a query, send it to us.

May 9.—New Zealand. One 25-ton electric o.h. travelling crane for Gisborne substation. New Zealand State H.E. Dept.
May 11.—Australia. 13,500 kVA power transformer for substations. Specification No. 1354. General Manager, Sydney City Council. Deposit £220.
May 15.—S. Africa. 66 kV, 150 and 250 MVA switchgear. Room 19, Head Office, Electricity Department, President Street, West, Johannesburg.
May 16.—New Zealand. One set of 110 kV switchgear for Mt. Roskill substation. State H.E. Dept., Wellington. B.o.T. (Ref. CRE (IB) 44042/50).*

CONTRACTS PLACED

Birmingham T.C. Electrical installation for Central library. Reynolds and Bradwell, Ltd. £7,050.
Carlisle T.C. Provision of mercury vapour lighting in London Rd. and Newtown Rd. G.E.C. £1,914 and £1,730 respectively (recommended).
Luton T.C. Electrical sub-contracting work for 230 new houses on Farley Hill estate. Enfield Electric Co., Ltd. £8,745 (recommended). Monk and Co. have withdrawn their tender of £7,600 for electrical work in 220 houses on the estate.
Washington U.D.C. Electrical installation in 44 new houses. Devereux, Moodie and Co., Ltd.
West Hartlepool T.C. Electrical installation in 88 houses on Rift House estate. Illuminated Installations, Ltd.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	153 0 0	£140 0 0
Delivered in 2nd and 3rd month after order	155 10 0	—
Delivered in 4th, 5th and 6th month after order	158 0 0	—
LEAD, good soft pig (foreign)	84 0 0	84 0 0
" " " " "English" quality	85 10 0	—
Delivered in 2nd and 3rd month after order, plus	2 0 0	—
TIN (99·99 75%) (Cash)	602½-603½	—
" (3 months)	603½-604½	—
ALUMINIUM, commercial purity (del.)	112 0 0	—
ZINC	87 10 0	80 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	39 10 0	—
Mild Steel Tape (0·04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Electrical Fittings Co., Ltd.—Mr. A. E. Attwood, Queen Street Chambers, 90 Queen St., Cheapside, E.C.4, appointed liquidator, with a committee of inspection on Mar. 6.

Mould and Corlett Ltd.—Creditors to send particulars of debts or claims to the liquidator, P. J. Snow, 17 Albion St., Hanley, Stoke-on-Trent before Apr. 14.

Ward Electrical Engineering Co., Ltd.—Order for compulsory winding-up made by Justice Wynn Parry on Mar. 13 on a creditors' petition for £478. There was no opposition.

Receiving Order

Croydon.—H. F. Mouncey, 4 Cromer Road, Tooting, S.W.17. Electrical engineer. Receiving order on creditors' petition made on 6th March.

Voluntary Liquidation

Domel Supply Co., Ltd., Fulham Rd., Chelsea, London S.W.10. Wholesale electrical and hardware merchants. At a recent meeting of creditors a statement of affairs showed liabilities amounting to £9,011, all due to unsecured creditors. Assets were estimated to produce £1,327 and after allowing £453 for preferential claims, there were net assets of £874, or a deficiency as regarded the creditors of £8,136. Issued capital of the company amounted to £1,000 and, so far as the shareholders were concerned, there was a total deficiency of £9,136.

The company was registered on Feb. 7, 1946, with a nominal capital of £1,000, all of which had been issued, but the venture was never successful, and the 1947 trading accounts showed that there was a net loss of £2,304. In explanation of the losses it was stated that, shortly after incorporation the company acquired large stocks of electric fires and clocks, the price of which subsequently dropped very considerably.

A resolution passed confirmed the voluntary liquidation of the company with Mr. M. Thei, of Messrs. Maurice Thei, Adler and Co., accountants, 19 Charing Cross Rd., London, W.C.2, as liquidator, together with a committee of inspection.

Intended Dividend

Preston.—A. F. Howsley, "Summerford," Emesgate Lane, Silverdale, Lancs, formerly in business as electrical engineer, at 25 Emesgate Lane, Silverdale. Last day for receiving proofs, Mar. 28. Trustee: E. T. Eaves, 47 Mosley St., Manchester 2.

TRADE NOTES

Agents.—THE GREENGATE AND IRWELL RUBBER CO., LTD. has appointed F. C. DUNCAN AND CO., 20 Church Street, Belfast, as their agents for electric cables in Northern Ireland.
Hunt's Trimmers.—In order to devote their energies to fixed capacitors, A. H. HUNT LTD. will discontinue the manufacture of trimmer capacitors as from Apr. 1 next. To ensure continuity of supplies of the special types manufactured by Hunts, the tools and equipment have been acquired by SYDNEY S. BIRD AND SONS, LTD., Cambridge Arterial Road, Enfield, Middx. Arrangements have been made for supplies of trimmers to be available from A. H. Hunt Ltd. to the wholesale and service trades as hitherto. Hunt's also announce that the new factory premises at Wrexham, Denbighshire, have recently been opened.
New Phone No.—As from Mar. 24, the telephone number of the Edinburgh branch of BRITISH INSULATED CALLENDER'S CABLES LTD., is Central 6876/7.
Metals Prices.—As from Mar. 15, the prices of good ordinary brand zinc was increased by £2 to £87 10s. a ton, the Ministry of Supply has announced. The price of good soft pig lead was also reduced by £4 to £84 a ton delivered, as from March 16.
Motor Factory.—Within a few months the Leeds works of the BRUSH ELECTRICAL ENGINEERING CO., LTD., at Firth Road, Beeston, will close down. The company recently acquired the Hopkinson Electric Co., Ltd., Birchgrove, Cardiff, and because of the greater facilities there, a decision to transfer from Leeds was taken.

BUSINESS PROSPECTS

HOME

Belfast. Erection of 196 dwellings at Dundonald for N.I. Housing Trust. Officer of the Trust, 12 Donegall Square West, Belfast (top floor).

Berkshire C.C. Erection of hutted classrooms and workshops at Institute of Further Education, Ormonde House, Newbury. County Architect, Wilton House, Parkside Rd., Reading.

Blackpool T.C. Erection of 18 houses at Mereside estate. Borough Surveyor, A. Hamilton, Municipal Buildings, Blackpool.

Breconshire C.C. Alterations to Builth Wells county grammar school. County Architect's Office, Rhyd Offices, Brecon.

Brighouse T.C. Erection of 30 houses at Stoney Lane, Lightcliffe. Borough Engineer and Surveyor, H. A. Sneezum, Commercial St., Brighouse.

Burnley R.D.C. All trades work for erection of 4 houses at Blacko and 18 at Foulridge. Surveyor, Council Offices, Reedley, Burnley.

Castle Donington R.D.C. Erection of 16 houses at site near Broadhill Rd., Kegworth. McCarthy, Collings and Co., Architects, 187 Forest Rd., Coalville.

Cuckfield U.D.C. Propose to substitute electric lighting for present gas lighting in 365 houses at Haywards Heath, Cuckfield and Lindfield.

Cudworth U.D.C. Erection of 22 houses on Sidcup and Churchfield Terrace sites. J. Hinchcliffe, Engineer and Surveyor, Council Offices, Cudworth, Barnsley.

Darwen T.C. Library committee approved in principle scheme for re-wiring library buildings. Estimated cost, £1,215.

Dudley. Extensions to Lingwood hostel, St. James Rd., for training college. Council Architect, A. C. H. Stillman, Green Hall, Lichfield Rd., Stafford.

Essex C.C. Recommended to approve scheme for provision of two-way radio communication in county ambulances. Estimated cost £12,000.

Eton U.D.C. Erection of 16 houses on Tilston Field site, Eton Wick. Engineer and Surveyor, High St., Eton.

Evesham T.C. Erection of 42 houses on Fairfield site. Architects, Pemberton and Bateman, 21 Vine St., Evesham.

Hull T.C. Erection of 16 houses, St. Paul's St. area, and 24 houses, Marlborough Terrace. A. Rankine, City Architect, Guildhall, Hull.

Ilford T.C. Conversions to depot in Clarks Rd. to provide workshop and office accommodation. Borough Engineer and Surveyor, Town Hall, Ilford.

Leyton T.C. Erection of prefabricated building for use as additional offices at Sidmouth Rd. Borough Engineer and Surveyor, Town Hall, Leyton E.10.

Liverpool T.C. Erection of 30 flats at Grinfield Street, 30 at Elm Grove, and 9 houses at Gaerwen Street, Farnworth Street area. City architect, and Director of Housing, Blackburn Chambers, Dale Street, Kingsway, Liverpool 2.

Mirfield U.D.C. Erection of 20 houses and 8 bungalows on Kitson Hill and Hopton Lane estates. Engineer and Surveyor, Council Offices, Mirfield.

Mossley T.C. Construction of 40 houses at Micklehurst housing site. Architects, Howard and Benson, 88 Mosley St., Manchester 2.

Newbury R.D.C. Adaptation of hutted camp at Station Rd., Thatcham, for temporary housing accommodation.

Newcastle-on-Tyne T.C. Erection of another 150 houses on Longbenton estate. City Architect, George Kenyon, 18 Cloth Market, Newcastle.

Newton Aycliffe Tenders are being obtained by Aycliffe Development Corporation for erection of 83 brick houses at Clarence Farm East, Newton Aycliffe. Architects, Grenfell Baines Group, Simpasture, Newton Aycliffe.

North Riding C.C. Electrical installation at police headquarters reported to be defective. Estimates being prepared by C.C. for renewal.

Northumberland C.C. To build a school between Broadway East and Harewood Rd., Gosforth. Erection of 43 police houses on 13 sites in the county. County Architect, County Hall, Newcastle-on-Tyne.

Norwich T.C. Erection of maternity and child welfare clinic at Tuckswood estate. City Architect's Office, City Hall, Norwich.

Salop T.C. Erection of six pairs of firemen's houses at Springfield estate, Wenlock Rd., Shrewsbury. County Architect, A. G. Chant, Column House, London Rd., Shrewsbury.

Skipton U.D.C. Erection of houses on Horse Close estate. K. B. Robinson, Engineer and Surveyor, Town Hall, Skipton.

Smethwick T.C. Erection of 12 houses at Perry Hill, Oldbury, and Halford St. R. Fletcher, Borough Engineer and Surveyor, Council House, Smethwick.

Sodbury R.D.C. Erection of 26 houses at Chipping Sodbury and 6 at Iron Acton. Surveyor, B. K. Nightingale, Council Offices, Chipping Sodbury.

Surbiton T.C. Recommended to re-invite tenders for installation of electric wiring in 20 houses on Tolworth estate.

Tutbury R.D.C. Erection of 10 houses. Engineer and Surveyor, Council Offices, 44 Rolleston Rd., Burton-on-Trent.

Wimbourne and Cranbourne U.D.C. Erection of 12 houses at Dean End, Woodcutts, in Sixpenny Handley. Architects, Crickmay and Sons, 7 Church St., Wimbourne.

Worksop R.D.C. Construction of 32 houses at Le Brun Square, Carlton-in-Lindrick. Architect, D. B. Thompson, 83 Bridge St., Worksop.

OVERSEAS

China. China Development and Industrial Co. of Rooms 101-103, 220 Szechuen Rd., Shanghai, have asked to be put in touch with U.K. exporters of electric cable and copper wire.

Luxembourg.—Civil Aviation authorities are expected shortly to call for tenders of the provision of runway lighting at the Luxembourg airport. Firms' literature on runway lighting should be addressed to Monsieur Hamer, Ministere des Transports (Aviation Civile), Luxembourg.

New Zealand. Grover Electrical Co., Ltd., 3 Vivian St., Wellington, C.3, are anxious to secure agencies from U.K. manufacturers of lampholders, switches and wiring accessories, electrical glassware, single phase electric motors up to 1 h.p. or similar three phase types, petrol engines up to 2 h.p. and generators to go with them, generator sets up to 500 watts, high quality electricans' tools, insulation tapes, iron-clad switchgear, and switchgear for radios up to 100 amps, control gear and circuit breakers, electric hand drills up to $\frac{1}{4}$ inch, wood screws, home service electric meters and thermostats, electric shavers, condensers and volume controls for radios.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Belling-Lee. B672,313. Class 9. Electrical fittings and parts of radio and television instruments and apparatus. Belling and Lee, Ltd., Cambridge Arterial Rd., Enfield, Middx.

Fonadek. 684,826. Class 9. Sound amplifiers, sound receiving, transmitting and telephonic instruments and apparatus. J. C. S. Branson, 58 Croftdown Rd., Harbourne, Birmingham17.

Microsen. 683,109. Class 9. Control apparatus for controlling the speed of electric motors. J. H. Curruthers and Co., Ltd., Polmadie, Glasgow, S.2.

Spirette. 676,347. Class 11. Heating and ventilating apparatus. Spiral Tube and Components Co., Ltd., Honeypot Lane, Stanmore, Middx.

Tom Tit. 679,793. Class 9. Radio sets. Troy Sales Co., 18 Hill Rise, Richmond, Surrey.

MEETINGS TO NOTE

THURSDAY, MARCH 23

I.E.E. (N. Midland centre, education discussion).—"The Teaching and Functions of Mathematics in Electrical Engineering Courses," W. Paterson, 24 Aire Street, Leeds.—6 p.m.

I.E.S. (Nottingham centre).—"The Problems Associated with Underground Lighting in British Coalmines," D. A. Strachan. East Midlands Gas Board, Parliament Street, Nottingham.—5.30 p.m.

FRIDAY, MARCH 24

N.E. COAST INSTN. OF ENGRS. AND SHIPBUILDERS.—"Electric Power Station Efficiency," T. P. Everett. Mining Institute, Newcastle-on-Tyne.—6.15 p.m.

I.E.E. (N.E. Students).—"Patents and the Electrical Engineer," L. H. A. Carr. Grey's Hall, King's College, Newcastle-upon-Tyne.—7 p.m.

I.E.E. (N. Midland centre).—"Management and the Engineer," W. H. Dunkley. Offices of Yorkshire Electricity Board, Ferensway, Hull.—7.30 p.m.

A.S.E.E. (S.E. London branch).—Joint lecture with S.E. London Electrical Engineering Society. "Telephone and Exchange Work," W. H. Dibben. S.E. London Technical College, Lewisham.—8 p.m.

MONDAY, MARCH 27

I.E.E. (Radio section).—"The Operation and Maintenance of Television Outside Broadcast Equipment." T. H. Bridgewater. Institution, Savoy Place.—5.30 p.m.

I.E.E. (N.E. centre).—"Some Experiences with a British A.C. Network Analyser." Neville Hall, Westgate Road, Newcastle-on-Tyne.—6.15 p.m.

I.E.E.) Western utilization group).—"Technical Considerations Affecting the Development and Design of Electrical Control Gear for Machine Tools," A. R. Thorne. Electricity House, Bristol.—6 p.m.

TUESDAY, MARCH 28

I.E.E. (Scottish centre).—"Visual Methods in Engineering Teaching," H. E. Dance, Instn. Engrs. and Shipbuilders, 39 Elmbank Crescent, Glasgow C.2.—7 p.m.

LUTON ELECTRICAL SOCIETY.—"A Typical Factory Distribution System," J. T. Ludham and B. F. Stenning. Luton Chamber of Commerce, George Street West, Luton.—7.30 p.m.

WEDNESDAY, MARCH 29

I.E.E. (Southern centre).—"The Cost and Efficiency of Earthing on Low and Medium-voltage Overhead Line Systems," L. Gosland. 17 New Canal, Salisbury.—5.45 p.m.

I.E.E. (Supply section).—"Some Experience with a British A.C. Network Analyser," G. Lyon. Institution, Savoy Place, W.C.2.—5.30 p.m.

I.E.E. (N.W. centre radio group).—"The Electrical Breakdown Strength of Air at Ultra-High Frequencies," J. A. Pim. Engineers' Club, Albert Square, Manchester.—6.30 p.m.

THURSDAY, MARCH 30

A.S.E.E. (Luton branch).—"Cold Cathode Lighting," E. A. Langsdon. George Hotel, George Street, Luton.—7.45 p.m.

E.P.E.A. (Midland technical group).—"Oil Filled Cables," P. W. Cave. Service Centre, Midlands Board Showrooms, Darlington St., Wolverhampton.—7 p.m.

INSTN. RADIO ENGRS (S. Midlands section.).—"Electronics and the Brain," H. W. Shipton. Room A5, Coventry Technical College.—7 p.m.

I.E.E. (ordinary meeting).—Symposium of papers on the MKS system of units. Institution, Savoy Place, W.C.2.—5.30 p.m.

ENGRS GUILD (Metropolitan branch).—"The objectives and organisation of the Engineer's Guild," J. H. W. Turner. Lighting Service Bureau, Savoy Hill, W.C.2.—6 p.m.

FRIDAY, MARCH 31

I.E.S. (Huddersfield group).—"The Latest in Electric Lamps," H. L. Privett. Electricity showrooms, Market Street, Huddersfield.—7.15 p.m.

INSTN. MECH ENGRS (steam group).—"A Contribution to the Theory of Natural-Draught Cooling Towers," B. Wood and P. Betts. Storey's Gate, St. James' Park, S.W.1.—5.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Goodman Electric Ltd., 4 Richmond Buildings, Dean St., W.1. Manufacturers of and dealers in electrical and neon signs, etc. Cap.: £1,000. Dirs.: H. C. Madams, S. A. Bonnett and W. J. E. Goodman.

L. V. Shirley Ltd., 57 Windsor Rd., Slough, Bucks. Refrigeration, electrical, heating, radio, motor and general engineers, etc. Cap.: £2,000. Dirs.: R. G. Cornish and L. V. Shirley.

N.F.P. Electrical Installations, Ltd., 49 Queen Victoria St., E.C.4. To take over business carried on at 20 Pimlico Rd., S.W., by Geo. J. Nicholls and Donald A. Poole. Cap.: £1,000. Dirs.: G. J. Nicholls, D. Poole and E. J. Farley.

Reay Electrical (Stockton) Ltd., West Row, Stockton-on-Tees, Co. Durham. Cap.: £1,000. Dirs.: J. K. Reay and J. L. Reay.

Smith and Forshaw Ltd., 5 Blayds Yard, Leeds. To take over bus. of electricians cd. on as "McDowell and Mearns" at Leeds. Cap.: £1,000. Dirs.: C. H. Dyson, L. F. Smith and J. S. Forshaw.

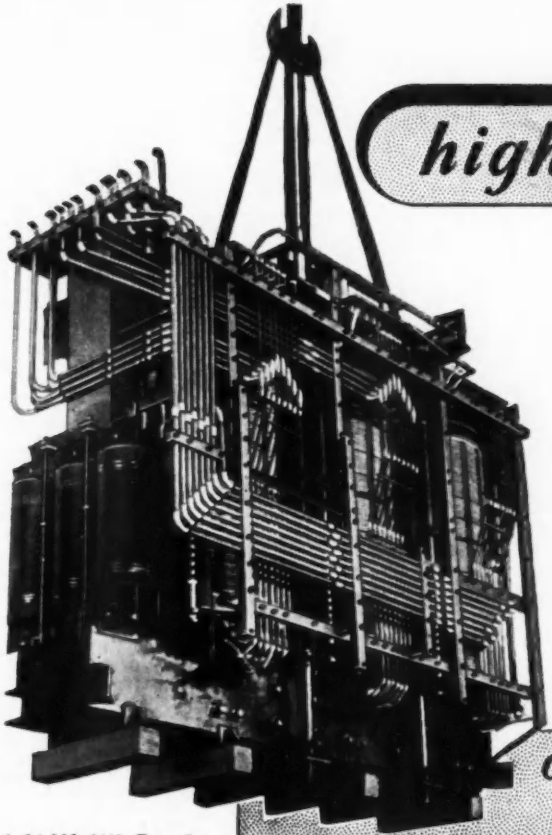
Tide Electrical Co. Ltd. Cap.: £1,000. Dirs.: L. W. R. Wratten, 54a High St., Staines, Middx., and V. L. Martin.

Brush Export Ltd., Falcon Works, Loughborough, Leics. Electricians, mech. engrs and mnfrs., etc. Cap.: £100,000 Dirs.: A. P. Good, Hon. A. C. Geddes, A. H. Syme, J. W. C. Milligan, and R. Bate.

Gilbert and Stamper Ltd., 34 Quarry Hill Rd, Tonbridge, Kent. To take over bus. of elec., wireless and refrigeration engrs. cd on as "Gilbert and Stamper" at Tonbridge. Cap.: £8,000. Dirs.: R. A. R. Stamper, J. B. Johnstone.

J.C. (Wholesale) Electric Supplies Ltd., Plantation Hse, 31/4 Fenchurch St, E.C.3. Cap.: £1,000. Dirs.: R. B. E. Woodhouse, J. H. Eden.

Mica and Insulating Supplies (Christchurch) Ltd., 8 Queen Street, Cheapside, E.C.4. Cap.: £5,000. Dirs.: H. Allwood and Margaret M. Allwood.



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TRANSMISSION and Distribution Engineers the world over have learnt from long experience to look up to the high quality of design and workmanship in HACKBRIDGE Transformers.

The Hackbridge and Hewittic Electric Co. Ltd., is very proud of this reputation, sustained over a period of more than a quarter of a century, during which over **SIXTEEN MILLION kVA** of HACKBRIDGE Transformers have been manufactured, including a number of the world's largest units.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

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All the newest technical improvements available to contractors will make this new estate a worthy contribution to the housing problem. It will make big demands on electrical services for its many domestic needs. So, METALLIC conduits will assuredly be specified—chosen for its unfailing reliability, meticulous accuracy and simplicity of assembly. METALLIC is processed from laboratory-tested flawless metal—

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

COUNTY BOROUGH OF BELFAST

ELECTRICITY DEPARTMENT

TENDERS are invited for the supply, delivery and erection, at the Harbour Power Station, of:—

6,600 and 400 V Auxiliary Switchgear and Accessories.

Form of tender, in quadruplicate, conditions of contract, specification, and drawings may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set which sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 6,600 and 400 V Switchgear and Accessories, Harbour Power Station," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 28th April, 1950.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast. (E 196)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

ULLAPOOL/LOCHINVER DISTRIBUTION

TENDERS are invited for Wood Pole Transmission and Distribution Lines to be constructed in the Ullapool/Lochinver District, County of Ross and Cromarty.

Copies of the tender documents may be obtained on application by not later than 31st March, 1950, to the Engineers, Messrs. Strain and Robertson, 154 West George Street, Glasgow. Applications should be accompanied by cheque for deposit of £2 (returnable on receipt of a bona fide tender and return of the tender documents).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace, Edinburgh, 3.
16th March, 1950. (E 195)

BURGH OF LOCKERBIE

TENDERS are invited for the whole of the following works in connection with the provision of Street Lighting on Trunk Road A.74 within the Burgh of Lockerbie.

(a) Provision of 47 tubular steel columns.
(b) Provision of 47 brackets and lanterns together with 140 watt sodium electric discharge lamps.
(c) Erection of columns and installation of lighting equipment.

General conditions of contract and terms may be seen, and specification and bill of quantities may be obtained from the undersigned at the Town Hall, Lockerbie, on payment of a deposit of two guineas, which will be refunded on receipt of a bona fide Tender.

Tenders, in plain sealed envelopes, endorsed "Tender for Street Lighting—Trunk Road A.74," must be delivered to the undersigned not later than April 20, 1950.

GEORGE STEVENSON,
Town Clerk.

Lockerbie. (E 183)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

APPOINTMENTS VACANT

COUNTY BOROUGH OF BLACKPOOL

APPOINTMENT OF A TECHNICAL ASSISTANT (ELECTRICAL)

APPLICATIONS are invited for the superannuable appointment of a Technical Assistant (A.P.T. III) (£450 by £15 to £495) in the Electrical Services Department, to assist in the electro-technical work of the department.

The candidate should have experience of electricity distribution and street lighting, including the preparation of technical specifications. Preference will be given to a Graduate Member of the Institution of Electrical Engineers.

Applications, giving particulars of age, present position, qualifications and experience, and including the names and addresses of two referees, to be forwarded to the Illuminations and Street Lighting Officer, Electrical Services Department, Rigby Road, Blackpool, to reach him on or before the 31st March, 1950.

Canvassing of or the submission of the names of members of the Council as referees will disqualify candidates.

TREVOR T. JONES,
Town Clerk.
(E 179)

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area, Hemel Hempstead District

APPLICATIONS are invited for the position of SENIOR ASSISTANT (Sales) in the commercial department at the Hemel Hempstead District.

The successful applicant would be required to develop the sale of appliances, etc., through the Service Centres and by Outside Representatives and generally supervise all aspects of this work. A knowledge of estimating for wiring installations on new housing estates and of maintenance work would be advantageous.

The provisional salary for this appointment will be between £500 and £550 per annum, and future salary and conditions of employment will be in accordance with the terms and conditions laid down from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Applications, stating age, education, technical qualifications and experience, full details of present appointment and whether married or single, together with the names of two referees, should be addressed to: The District Manager—Hemel Hempstead, Chilterns Sub-Area, Eastern Electricity Board, The Marlowes, Hemel Hempstead, Herts, to reach him not later than fourteen days from the date of this advertisement. (E 211)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

STAFF VACANCY NOTICE No. 90

APPLICATIONS are invited for the appointment of SHIFT CHARGE ENGINEER at the Crewe Power Station.

The commencing salary will be £430 per annum in accordance with Class "A," Grade 7, of the revised National Joint Board Schedule.

Applicants should have had experience in the shift operation of generating plant, and possession of a Higher National Certificate or equivalent qualification would be an advantage.

The appointment will be superannuable under the British Electricity Authority and Area Boards Superannuation Scheme, and is subject to a medical examination.

Forms of application can be obtained from the Divisional Secretary, British Electricity Authority Merseyside and North Wales Division, Clarke Gardens, Woolton, Liverpool, and should be returned to him to be received not later than Tuesday, April 4, 1950. (E 215)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

(*a*) METER TESTERS
(*b*) INSTALLATION INSPECTORS

APPLICATIONS are invited for the appointment of (*a*) Meter Testers in the Sub-Area Central Testing Station at Romiley, Cheshire; (*b*) Installation Inspectors for the Stockport and Hazel Grove Districts.

The wages and working conditions for both types of vacancy will be in accordance with the Agreement of the National Joint Industrial Council for the Electricity Supply Industry, the present rate being for:—

(*a*) 35·00d. per hour (£6 8s. 4d. for a 44-hour week).
(*b*) 37·25d. per hour (£7 0s. 3d. for a 44-hour week).

Applicants for (*a*) should have had experience in the testing and calibration of single- and poly-phase a.c. meters. Applicants for (*b*) should have had experience of electrical installation work and the testing of domestic, commercial and industrial electrical installations.

Technical qualifications up to the ordinary national standard will be an advantage.

Applications, stating age, training and experience, present position and wage, should be received by J. Harwood Lumsden, Esq., M.I.Mech.E., A.M.I.E.E., Manager, No. 7 Sub-Area, North Western Electricity Board, Electricity Offices, Chapel Street, Hazel Grove, Cheshire, not later than the 3rd April, 1950. (E 190)

SOUTHERN ELECTRICITY BOARD

No. 4 (Bournemouth) Sub-Area

APPOINTMENT OF DISTRICT COMMERCIAL OFFICER

APPLICATIONS are invited for the post of District Commercial Officer in the Southampton District of the Board.

Candidates should have had wide experience in all aspects of consumer service, including administration of service centres, preparation of specifications and estimates for all types of electrical installations, supervision of maintenance and contracting work, and staff employed thereon, and should also have a sound knowledge of tariffs and electricity commercial statistics.

The provisional salary, which is subject to adjustment by the appropriate negotiating machinery, will lie within a range of £700-£750 per annum. Conditions of service as prescribed from time to time.

If eligible the successful applicant will, subject to certain conditions, be required to join the B.E.A. and Area Boards Superannuation Scheme.

Applications should be made on forms obtainable from the Sub-Area Secretary at 1 Priory Road, Bournemouth, which must be returned to him in envelopes endorsed "District Commercial Officer, Southampton," not later than 14 days after the appearance of this notice.

F. W. KEMPTON,
Secretary.
(E 193)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts on the Staff of the Generation Engineer (Construction):—

(a) GENERAL ASSISTANT ENGINEERS (Civil) and (Mechanical). Salary range £437-£586 p.a.

The work will include the construction of new generating stations and the modification of existing stations. Applicants should have suitable technical training and qualifications admitting to corporate membership of one of the Senior Engineering Institutions.

(b) LEADING DRAUGHTSMAN (Mech.). Salary range £579-£731 p.a.

Applicants must have had a sound drawing office and works training with large manufacturers of power station plant, and have had wide experience in the layout and construction of modern generating stations, especially on the civil and mechanical side. They should preferably be corporate members of one of the Senior Engineering Institutions.

(c) QUANTITY SURVEYOR. Salary range £579-£731 p.a.

Applicants should be Associates of the Royal Institution of Chartered Surveyors (Quantities Division) or hold equivalent qualifications. They should have had experience in the preparation of Bills of Quantities for large civil engineering works—preferably generating station construction work, and the measuring of work in progress and on completion.

All the above posts are superannuable and subject to satisfactory medical examinations.

Applications for forms, stating for which post candidates wish to apply, should be addressed to the undersigned. All forms should be returned not later than April 5, 1950.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
High Street, Portsmouth.
March 18, 1950. (E 210)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT SECTION ENGINEERS, TRANSMISSION DEPARTMENT

APPLICATIONS are invited for the positions of Assistant Section Engineers in the Transmission Department.

Commencing salary will be within the salary range £516-£647 per annum, according to qualifications and experience, and thereafter according to divisional classification.

Candidates should have a wide experience in the operation and maintenance of high voltage transmission lines, cables, and switchgear up to 132 kV, and should hold corporate or graduate membership of I.E.E. or equivalent qualifications.

The appointment will be subject to the successful applicant entering the British Electricity Authority's Superannuation Scheme.

Applications should be submitted on the official form of application, which may be obtained from the Divisional Establishments Officer at the under-mentioned address, and be returned not later than April 12, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate, Nottingham.
17.3.50. (E 212)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TRANSMISSION CONSTRUCTION DEPARTMENT
DIVISIONAL HEADQUARTERS

APPLICATIONS are invited for appointment as SENIOR ELECTRICAL DRAUGHTSMAN in the Transmission Construction Department at Divisional Headquarters, Bristol.

The salary will be within the range £450 to £600 per annum according to experience and qualifications. The commencing salary and the salary range will be regarded as provisional pending negotiations between the authority and the appropriate organisation.

Duties will be largely concerned with the preparation and checking of layout and site drawings for outdoor high voltage sub-stations under construction or in the project stage.

Applicants must have had extensive experience in the layout of 132 kV and 33 kV outdoor sub-stations and their associated equipment. Some experience in building and site works would be an advantage.

Applications, stating age, qualifications, and full details of experience, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, 26 Oakfield Road, Bristol 8, so as to be received not later than April 3, 1950.

R. C. BARRETT,
Divisional Secretary.
March 16, 1950. (E 189)

BOROUGH OF ST. MARYLEBONE

Borough Engineer's Department

APPOINTMENT OF ELECTRICAL SUPERINTENDENT

APPLICATIONS are invited for the appointment o Electrical Superintendent, Grade APT IV (£480 per annum rising by annual increments of £15 to £525 per annum), plus London weighting.

Candidates should hold the Higher National Certificate in Electrical Engineering and must possess sound knowledge and practical experience of general installation and maintenance of electrical engineering work.

The successful applicant will be required to superintend the maintenance, repair and extension of lighting and power installations in the Council's streets and buildings by Direct Labour or Contract, to superintend the maintenance of existing Traffic Control Signals and the erection of new installations by Contract, and to carry out such other duties as may be assigned to him by the Borough Engineer.

The appointment, terminable by one month's notice on either side, will be subject to satisfactory medical examination by the Council's Medical Officer; to proof of age by production of birth certificate; to the National Scheme of Conditions of Service as adopted by the Council; and to compliance with the provisions of the St. Marylebone Borough Council (Superannuation) Acts, 1908-1936, and any modifications thereof.

Forms of application are not issued, but candidates must write, stating age, qualifications, present position and salary, particulars of past appointments and all other essential information, and giving the names of three referees.

Applications must be received by the Town Clerk, Town Hall, St. Marylebone,W.1, not later than Saturday April 15, 1950. Canvassing will disqualify.

(E 177)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

(a) INSTALLATION ENGINEER, Plymouth District (Headquarters Plymouth) at a commencing salary of £519 p.a. (Grade 9 Class "E", new N.J.B. Schedule). Candidates should have had extensive experience in electrical contracting, preparation of specifications and estimates, installation and maintenance of consumers' appliances and have knowledge of direct sales and hire purchase negotiations.

(b) CONSTRUCTION ENGINEER, Taunton District (Headquarters Taunton) at a commencing salary of £494 p.a. (Grade 9 Class "D", new N.J.B. Schedule). Candidates should have had experience in the survey and construction of 11 kV O/H. and MV/LV lines in rural areas; the successful applicant will be required to supervise new engineering projects including surveys, procurement of wayleaves and estimating extensions.

(c) SURVEYORS (2), Bristol and North Somerset Sub-Area (Headquarters Bristol). Provisional salary within range £450 to £500 p.a. The successful candidates will be required to undertake all surveying work for O/H and U/G distribution systems, including the preparation of profiles and quantity schedules.

The salaries for all these posts are provisional pending negotiation.

Detailed applications, stating age, present appointment and salary, qualifications and experience, to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, not later than April 3, 1950. (E 220)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of ASSISTANT in the Purchasing Department of the Secretary's office.

The successful applicant should have experience in the buying of all types of electrical and mechanical parts and general stores, and preference will be given to persons with wide experience in buying stores for stations, transmission lines and sub-stations.

The salary for this appointment will be within the interim salary range Grade "B," £450-£550 per annum, and will be subject to the successful applicant entering the Authority's Superannuation Scheme.

Applications should be submitted on the official form of application, which may be obtained from the Divisional Establishments Officer at the under-mentioned address, and should be returned not later than April 5, 1950.

British Electricity House, Barker Gate, Nottingham. 17.3.50.

W. S. BURGE, Divisional Controller. (E 209)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF METER TESTERS

APPLICATIONS are invited for the above positions in the Sub-Area Testing Station at the Tame Valley Works, Stalybridge.

The terms and conditions of employment will be in accordance with those laid down by the National Joint Industrial Council for the Electricity Supply Industry, the present rate of pay being 35.00d. per hour for a 44-hour week.

Candidates should have had experience in the calibration and testing of a.c. and d.c. meters and be familiar with pre-payment mechanisms. Experience in the use and care of precision electrical instruments is essential and candidates with technical qualifications will be given preference.

Applications, stating age, full details of experience, previous positions held, present position and education, should be received by E. Binns, Esq., M.I.Mech.E., A.M.I. E.E., Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Greenhill Offices, Oldham, not later than Saturday, April 8, 1950. (E 213)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

BOILER HOUSE SHIFT CHARGE ENGINEERS
LONGFORD GENERATING STATION

APPLICATIONS are invited from suitably qualified Engineers to take charge of shift operation of Boiler House Plant at Longford Generating Station, Coventry.

Applicants must possess a sound technical training, have had good general engineering experience, a knowledge of the control and operation of large water tube boilers, ancillary plant and in the efficient combustion of fuels on Chain Grate Stokers.

Commencing salary in accordance with Class "G," Grade 9 of the National Joint Board Schedule, at present £571, rising to £597 per annum. The appointment will be superannuable under terms and conditions of the British Electricity Authority's Superannuation Scheme.

Applications to be submitted on forms obtainable from the Divisional Establishments Officer at the under-mentioned address and when completed to be returned not later than April 9, 1950.

W. S. BURGE, Divisional Controller.

British Electricity Authority, East Midlands Division, British Electricity House, Barker Gate, Nottingham. 15.3.50. (E 184)

NORTH WESTERN ELECTRICITY BOARD

No. 3 Sub-Area

APPOINTMENT OF TESTING ASSISTANTS

APPLICATIONS are invited for the following appointments :—

(a) Testing Assistants in the Testing Section of the Technical Department at Stalybridge.

Applicants should have had good general experience of field testing work such as commissioning and testing of protective gear, testing transformers and switchgear, pressure testing and testing work in connection with technical investigations. Experience in the testing and maintenance of supervisory and control schemes would be an additional recommendation.

(b) Testing Assistants in the Sub-Area Testing Station at Tame Valley Works, Stalybridge.

Applicants should have had extensive experience in testing and standardising all types of instruments used in large electricity supply undertakings together with experience in standardising instruments for use under the Electricity Supply (Meters) Act. Some experience in design and development work on instruments and associated apparatus would be an additional qualification and technical qualifications up to the Higher National Certificate standard are essential.

The salaries, which are provisional, will be within the range of Grade 3 of the Area Board's Scale, i.e., £400-£500 per annum.

Applications, giving full details of present and previous positions, training and experience, and stating age, education, and present salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, April 8, 1950. (E 214)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions on the staff of the Technical Engineer :

A GENERAL ASSISTANT ENGINEER in each of the following sections:

(a) Protective Gear.
(b) Metering.
(c) Communications.

Candidates should have had appropriate experience of technical work in one or more of the branches mentioned.

Conditions of service will be those approved by the National Joint Board, and the commencing salary will be within the range of £437-£586 per annum.

The posts are superannuable and subject to satisfactory medical examinations.

Candidates should either possess technical qualifications and experience admitting to corporate membership of the Institution of Electrical Engineers or equivalent, or be studying for the examinations of the Institute.

Forms of application may be obtained from the undersigned, and should be returned not later than April 6, 1950.

P. D. A. OLIVER, Divisional Secretary.

British Electricity House, High Street, Portsmouth. (E 216)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions in the Board's Cornwall Sub-area:

(a) DISTRICT COMMERCIAL OFFICERS.
(1) West Cornwall (Headquarters Hayle).
(2) Central Cornwall (Headquarters Truro).
(3) North Cornwall (Headquarters Bodmin).
(4) South Cornwall (Headquarters St. Austell).
(5) East Cornwall (Headquarters Liskeard).

The commencing salary for post (1) is £722 p.a.(Class "E," Grade 4, revised N.J.B. Schedule). The commencing salary for other posts is £667 (Class "D," Grade 4).

Candidates should possess extensive knowledge of, and have had wide experience on the commercial side of the industry, and should be Corporate Members of the I.E.E.

The duties attached to these posts will include preparation of technical schemes and estimates and participation in negotiations for supply of electricity to industrial premises ; supervision of preparation of statistical data and reports, contracting, load building, sale of apparatus and organising displays and demonstrations.

(b) PRINCIPAL ASSISTANT TO SUB-AREA COMMERCIAL OFFICER (Headquarters Redruth).

Provisional commencing salary £651 p.a. (Class "G," Grade 7, new N.J.B. Schedule).

The successful candidate will be required to assist, *inter alia*, in the preparation of contracts and agreements for supplies to all classes of consumers, including special contracts for Government Departments, Street Lighting Authorities, etc., to compile commercial statistical data, and to deputise for Sub-area Commercial Officer when absent.

The salaries for all these posts are provisional pending negotiation.

Detailed applications, stating age, present appointment and salary, qualifications and experience, to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, not later than April 3, 1950. (E 221)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEER (ELECTRONIC) required for the headquarters staff at the London Office. Salary scale £750 a year, rising to £1,000 a year. Extra duty allowance of 8 per cent. of annual salary also payable at present. Engagement will be on unestablished terms with a prospect, after satisfactory service, and as vacancies occur of appointment to the established and pensionable staff and promotion to a higher grade. Candidates should preferably hold an honours degree in electrical engineering (telecommunications and electronics) or be corporate members of the Institution of Electrical Engineers. They should have served an apprenticeship with a firm of electrical engineers manufacturing radio or associated equipment and have had subsequent experience on the manufacturing and technical side of the industry. The appointment will, in the first instance, be to the Inspection Department and candidates should be capable of dealing with the problems arising from the inspection of a wide variety of electronic equipment by a staff of Inspecting Engineers. Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.N.25333/3B) on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (E 192)

BRITISH ELECTRICITY AUTHORITY

London Division

INSTRUMENT ENGINEER—LOMBARD ROAD GENERATING STATION

APPLICATIONS are invited for the above position. Applicants should have had previous experience on instruments as used in a power station, particularly boiler house and engine room types, and should be capable of the supervision of instrument fitters. Technical education should be at least up to ordinary National Certificate standards.

Salary according to Class " H," Grade 10b, of the 1948 N.J.B. Schedule (subject to revision in terms of 1950 Schedule.)

Applications, stating age, qualifications and experience, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(E 218)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following vacancies in the System Operation Department:—
(i) FIRST ASSISTANT CONTROL ENGINEER
(ii) GENERAL ASSISTANT ENGINEERS

Applicants should have had practical training and have technical qualifications up to Graduate I.E.E. standard.

The commencing basic salary for (i) will be within the range £579, rising to £710, and for (ii) £437, rising to £569. To both will be added a London Allowance of 5 per cent. with a minimum of £25 per annum. These salaries are in accordance with Class " AX " Grades 5 and 8 respectively of the N.J.B. Schedule and are subject to an ultimate maximum in Class " EX " for (i) of £799, and for (ii) of £641, plus 5 per cent. London Allowance in each case.

Applications for the foregoing vacancies, stating age, qualifications and experience, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(E 219)

NORTH WESTERN ELECTRICITY BOARD

No. 6 Sub-Area

DISTRICT WAYLEAVE ASSISTANT
KENDAL DISTRICT

APPLICATIONS are invited for the appointment of District Wayleave Assistant in the Kendal District of the No. 6 Sub-Area.

The provisional salary for the post will be in accordance with Grade " A " of the Extension to the Interim Scheme of Salaries and Conditions of Service of the National Joint Council for the Electricity Supply Industry, i.e. £410 by £20 to £450 per annum.

Applicants must have had experience in negotiating wayleaves, the keeping of registers and the settlement of claims for damages arising out of the construction of supply lines.

Successful applicants will be required to reside in the district.

Applications, stating age, experience, present post and salary, should be received by J. E. Shepherd, Esq., M.I.E.E., A.M.C.T., Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Duke Street, Barrow-In-Furness, not later than Saturday, April 1, 1950. (E 191)

LONDON ELECTRICITY BOARD

COMMERCIAL STAFF

APPLICATIONS are invited for the following appointments:—

Wandsworth East District

DISTRICT COMMERCIAL OFFICER

Candidates should be experienced in the commercial development of electricity supply, the control of service centres, sales and staff, the control of an electrical contracting and maintenance department and the administration of hire and hire purchase schemes.

Preference will be given to Corporate Members of the Institution of Electrical Engineers, or applicants possessing similar qualifications.

The successful candidate will be responsible for the commercial organisation and development of the district.

The provisional salary will be up to £800 per annum. (EST.V.688.T)

Wandsworth West District and Fulham District

ASSISTANT DISTRICT COMMERCIAL OFFICERS

Applicants will be required to assist the District Commercial Officer in the commercial organisation and development of the district, and must have sound experience covering:—

Consumer service.
Commercial development of electricity supply.
Control of service centre, sales and staff.
Control of an electrical contracting and maintenance department and staff.
Administration and operation of hire and hire purchase schemes.

Preference will be given to applicants possessing the Higher National Certificate in electrical engineering.

The provisional salary will be up to £650 per annum. (EST.V.689.T)

South-Western Sub-Area

SUPERVISOR (APPARATUS RECONDITIONING)

The person appointed will be required to take charge of all apparatus reconditioning in the Sub-Area.

Applicants should have had a sound technical training and a wide practical experience of repairing, reconditioning, assembling and testing all types of electrical appliances and components. They should be capable of planning, organising and controlling a modern reconditioning workshop and be experienced in the control of labour.

The provisional salary will be up to £600 per annum. (EST.V.496.T)

Northern, North-Western, Western and South-Eastern Sub-Areas

DEMONSTRATORS

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including Electrical Housecraft, and have experience in conducting demonstrations at Service Centres and in general Service Centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the Centre and in the consumers' homes.

The provisional salary will be within the range £280-£400 per annum. (EST.V.690.T)

Southern and Western Sub-Areas

DEVELOPMENT ASSISTANTS

Applicants are required to have a knowledge of service to consumers, tariffs and their application. They should be familiar with electrical apparatus and be capable of advising consumers on domestic and small commercial and industrial installations.

The provisional salary will be within the range £280-£415 per annum. (EST.V.691.T)

The provisional salaries for all the above appointments will be dependent upon qualifications and experience, and will be subject to adjustment through the appropriate negotiating machinery.

Application forms, obtainable from Establishments Officer, 46-47 New Broad Street, E.C.2, on receipt of an addressed foolscap envelope, to be returned duly completed not later than April 3, 1950. Please mark envelope and all correspondence with appropriate reference No. EST.V/—, as indicated after each post. (E 182)

ALLEN WEST AND CO., LTD., require for their Brighton sales department, two senior SALES ENGINEERS, aged 30 to 35. Must be conversant with all types motor control gear. Applications, stating qualifications, experience and salary required, should be addressed to J. H. Hall. (E 130)

ANGLO-IRANIAN OIL COMPANY requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London with visits abroad. Age, 23-30. Ordinary National Certificate in electrical engineering essential, Higher National Certificate desirable. Practical experience to include 5 years' apprenticeship followed by two years in the drawing office of a firm engaged in the design layout of power station plant, h.v. substations, switchgear, distribution networks and electrical installations. Applicants should write stating age, qualifications and experience quoting Department M.1297, to Box No. 5757, at 191 Gresham House, E.C.2. (E 223)

APPLICATIONS are invited from ELECTRICAL DESIGN DRAUGHTSMEN for development of heavy switchgear. Applicants should have at least H.N.C. in Electrical Engineering or equivalent, and manufacturing and D.O. experience of switchgear of not less than 10 years. Permanent staff position; accommodation.—Apply, quoting reference 129, to Central Personnel Services, English Electric Co., Ltd., 24 Gillingham Street, Westminster, S.W.1. (E 52)

ARMATURE and Stator Winders required. Only those with first-class experience need apply. E.T.U. rates of pay plus efficiency bonus. Good prospects of promotion.—Eaton Electrical Co. (Woolwich) Ltd., Lakedale Road, S.E.18. (E 196)

ASSISTANT CHIEF ENGINEER required by branch of a large electrical concern making rectifying equipment in Boreham Wood, Herts. Age 35-45. University degree. Corporate Member of the I.E.E. Experience of medium power commercial electrical engineering necessary, and knowledge of the theory and practice of power rectifiers desirable but not essential. Able to direct process development in physical and chemical fields. Permanent position with excellent prospects.—Write in confidence, stating age and full details of qualifications and experience to Box No. 1089, Electrical Times. (E 176)

ASSISTANT WORKS MANAGER for heavy electrical repair and manufacturing works. Small detached house available in pleasant suburb, North Midlands.—Box No. 1103, Electrical Times. (E 217)

CHIEF DRAUGHTSMAN required to control office for transformers up to 5,000 kVA.—Apply, giving age, experience and salary required to Box No. 1033, Electrical Times. (E 53)

CHIEF TIME AND MOTION STUDY ENGINEER required for group of factories in South Wales. These factories have no direct wage incentive systems and time study is used for work measurement and scheduling purposes. An engineering training with experience of speed and effort rating, together with a knowledge of modern administrative methods is essential. Age 28-45.—Write for application form to Employment Officer, Hoover Limited, Perivale, Middx. (E 197)

DESIGNER DRAUGHTSMAN wanted to specialise in all types of d.c. motors and generators. Shop experience essential.—Reply, stating fully, experience and qualifications, to Box No. 1083, Electrical Times. (E 148)

ELECTRICAL ENGINEERING DRAUGHTSMAN required for works with M.D. of 4,000 kVA, experienced in substation layouts and works electrical services, a.c. and d.c., including flat lighting. Some mechanical experience an advantage. Five-day week and pension fund. Apply, stating age, qualifications, details of experience and salary required, to Box No. 1077, Electrical Times. (E 132)

ELECTRICAL ENGINEER required for large factory in north-west England, experienced in high- and low-voltage distribution, power and lighting installations, automatic control equipment, and instrumentation.—Applications, stating full particulars of technical and practical training, appointments held and present salary to Box No. 1101, Electrical Times. (E 201)

ELECTRICIAN required. Fully experienced in domestic installations, with knowledge of L.V. O/H line erection. Previous employment with a Supply Authority desirable. N.J.I.C. Rates and Conditions.—Applications within 10 days, with full details and copies of testimonials to: Branch Manager, South Western Electricity Board, Lynton, N. Devon. (E 222)

ENG. DRAUGHTSMAN for S.W. London. Workshop experience and electrical knowledge.—Write: Box No. 1093, Electrical Times. (E 181)

ENGINEER DRAUGHTSMAN, with experience in design, layout, and installations of complete electrical equipment for gas and chemical plants, required by firm of engineers and contractors.—Apply, stating age, experience, and salary required, to Box No. 1097, Electrical Times. (E 199)

EXPERIENCED ESTIMATING ENGINEERS required in London and Manchester, capable preparing tenders for electrical rotating plant and attendant apparatus. Applications, stating age and salary expected, to Personnel Manager, Lancashire Dynamo and Crypto, Ltd., Trafford Park. (E 134)

EXPERIENCED ORDER CLERK at our Leyton Depot. State age, wages, experience.—M.D., Sloan Electrical Co., Ltd., 31-33 Bondway, Vauxhall, S.W.8. (E 152)

FOREMAN PIPE FITTER/WELDER required for large factory in north-west England, conversant with the installation, maintenance, and repair of high and low-pressure pipework for steam, water, and gas, with specialised knowledge of gas and arc welding. Heating installation experience desirable.—Applications, giving full particulars of experience, appointments held, and present salary, to Box No. 1099, Electrical Times. (E 200)

REPRESENTATIVE required by eminent London electrical wholesalers. Connection with contractors and industrial users in N.W. London area essential.—Apply in writing to B. Finch and Co., Ltd., 238 Waterloo Road, S.E.1. (E 206)

SENIOR AND JUNIOR ESTIMATORS required by Bull Motors, Ipswich. The work involved covers the preparation of quotations for small and medium-size electric motors, control gear, etc.—Applicants should submit full details of age, experience, salary required, to The Sales Manager, Bull Motors (E. R. and F. Turner, Ltd.), Foxhall Works, Ipswich. (E 207)

SENIOR PRODUCTION ENGINEERS required to scrutinise new designs of switchgear to simplify manufacture and reduce costs. Applicants must have appropriate experience in production, and either fabrication, or machine shop and assembly experience.—Write, giving full details quoting reference 212, to Central Personnel Services, The English Electric Co., Ltd., 24 Gillingham Street, Westminster, S.W.1. (E 208)

SWITCHGEAR DRAUGHTSMEN. Capable seniors required for contract work on h.t. metalclad gear. Full details of experience and technical education to South Wales Switchgear Ltd., Blackwood, Monmouthshire. Salary commensurate with ability. Houses available. (E 150)

TECHNICAL REPRESENTATIVE for North London area. Own car and outstanding personality essential. £450 p.a., expenses and commission. Must be experienced and hard-working.—Apply in writing to British Central Elec. Co., Ltd., 6-8 Rosebery Avenue, E.C.1, sending full details of career and testimonials. (E 188)

THE undermentioned firm, representing manufacturers of electrical equipment, including transformers, e.h.t. and l.t. switchgear, rectifiers, motors, cables, industrial and street-lighting equipment, etc., have vacancy for SALES and SERVICE ENGINEER, age about 30, with technical and practical experience. Specialised knowledge of switchgear and/or rectifier practice essential. Preference given to applicants with business connections in Scotland. Progressive position for capable man. Salary and commission basis.—Reply to Secretary, Morris, Warden and Co., Ltd., P.O. Box No. 124, 90 Mitchell Street, Glasgow C.1. (E 137)

TRANSFORMER DRAUGHTSMAN, experienced in ratings up to 3,000 kVA, required.—Apply, stating age, experience, and salary required, to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (E 149)

TRANSFORMER ENGINEER. A competent transformer designer with experience in the designing of all classes of power transformers is required.—Write, stating age, experience and salary required, to: Employment and Welfare Manager, Johnson and Phillips, Ltd. Charlton, S.E.7. (E 224)

TRANSFORMER MANUFACTURERS invite applications from highly qualified ENGINEER for important position on their Managerial Staff. Applicants must have first-class technical experience in the design and construction of transformers up to 132 kV. Some managerial experience would be an additional recommendation. The appointment will carry a total remuneration of £1,500 to £2,500 per annum depending on qualifications and experience.—Box No. 1091, Electrical Times. (E 180)

WORKS ENGINEER required to control new installation and maintenance of electrical, heating and building construction side, for firm having ten (10) works (each 100-200 men) throughout the country. Head Office in south-east, from where would be working. No accommodation available. Superannuation scheme.—Apply, Box No. 1095, Electrical Times. (E 186)

33 kV and 11 kV SWITCHGEAR DESIGN ENGINEERS required. Permanent situations; houses available.—Applications, giving full details of experience and qualifications, also commencing salary required, to Box No. 1059, Electrical Times. (E 84)

APPOINTMENTS WANTED

EL. ENG., 24, H.N.C. exp. relays, process timers and circuit design. London area.—Box No. 1069, Electrical Times. (E 105)

GRADUATE, age 24. A1 personality, G.I.E.E., G.I.P.E. Stud.I.I.A., desires progressive position Birmingham area. Salary of secondary importance. Gen. eng. experience.—Box No. 1027, Electrical Times. (E 43)

WINDING SHOP FOREMAN, thorough experience a.c. and d.c. repairs, rewinds, conversions assembly and testing desires change.—Box No. 1061, Electrical Times. (E 95)

WORK WANTED

A. C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co. Ltd., Stanmore, Middx. (D 324)

ALL types of IMMERSION HEATERS repaired; new reliable TUBULAR TYPE ELEMENTS fitted.—R. Hamilton & Co. Ltd., 27 Turner Street, Manchester 4. Tel.: Blackfriars 1744. (D 696)

ARMATURE ROTOR AND STATOR WINDING. We specialise in the repair and rewind of all types of electrical machines from fractional h.p. upwards. Special departments for vacuum cleaners, dryers, portable tools, etc. All work fully guaranteed.—Walter Crane, Greencoat Electrical Works, Westgate, Wakefield. Telephone 2172. (A 4)

BUSINESS wanted. Electrical repair works in London. Room for development.—Box No. 1013, Electrical Times. (E 9)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (D 328)

ZEROS REFRIGERATORS.—Complete range of repair and service now available. Equipment reconditioned to conform to pre-war manufacturers' specifications.—Time Engineers, Refrigeration Specialists, 60 Southend Road, Rainham, Essex. Tel.: Rainham 2358; or Southern Area Agency. Tel.: Springpark 4217. Electrical Spares supplied to the trade. (A 639)

WANTED

A. C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

ONE MOTOR GENERATOR SET. Input 400 V, 3-phase, 50 cycles. Output 6 V d.c., 5,000 amp. Alternatively: if delivery is better price for bare generator. Note: Generator should be of the separately excited type; to be operated from 110 V d.c. "works" supply. Machine to be offered complete with necessary control equipment but without instruments.—Box No. 1045, Electrical Times. (E 64)

VARIABLE SPEED COMMUTATOR MOTOR 75/37·5 h.p., 1,000/500 r.p.m. Any machine offered must have shaft centre rise not exceeding 18 ½in.—Box No. 1043, Electrical Times. (E 63)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22/26 Britannia Walk, London N.1. (A 13)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling.—Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

AGENCIES

ESTABLISHED AGENTS require additional Agencies from manufacturers of repute. Qualified technical and sales staff, centrally situated in South Midlands.—Box No. 1079, Electrical Times. (E 141)

FOR SALE

CABLES & WIRE

PAPER INSULATED ARMOURED CABLES to BSS 480/1942. Considerable stocks available.—Cable Jointers, Ltd., 49 Avenue Road, W.3. Acorn 4831/2. (D 319)

DOMESTIC APPLIANCES

IMMERSION HEATERS. Grubb 2 kW and 3 kW standard voltages, all lengths, 12 in. to 36 in. Also 4 kW (non-taxable), 16 in. to 36 in. Fully guaranteed and immediate delivery. For illustrated brochure, latest lists, and trade terms, write distributors, John Owner and Co., Springfield Road, Birmingham 13. Tel.: Spr. 2839. (C 392)

ENGINEERING PLANT & MATERIALS

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

OFFERS are invited for the Purchase, Dismantling and Removal of the following plant from the Power Station, North Lane, Elgin, Morayshire.

1-135 kW RUSTON/MATHER AND PLATT DIESEL GENERATOR, direct coupled, 480/530 V d.c., 300 r.p.m.

1-500 kW METROPOLITAN VICKERS ROTARY CONVERTOR with transformer and d.c. switchboards; 11,000 V, 3-phase, 50 cycles supply; 450/480 V d.c. output.

Arrangements to inspect the plant may be made with the undersigned, to whom the tenders should be addressed.

The Board does not bind itself to accept the highest or any offer.

A. CLARK,
Area Manager.

West Villa,
Elgin, Morayshire. (E 179)

ALLEN GENERATOR, 125 kW, 250 V d.c., 500 amp driven by 200 h.p. vertical Diesel engine compressed air starting with compressor, slate panel, switchboard connections, tank.—Details from: F. J. Edwards, Ltd., 35 Euston Road, London N.W.1. Euston 4681. (E 123)

LADDERS (wooden and aluminium, all types), Trestles, Steps, Handcarts, etc., from Ramsay and Sons (Forfar) Ltd., Forfar (Tel. 172). (C 603)

GENERATING PLANT

ALTERNATORS from stock, 400/440 V, 3 phase 50 c/s, 4-wire, with exciters and switchboards: 80 kW "Westinghouse" 1,000 r.p.m., 40 kW "E.C.C." 750 r.p.m., 28·1 kVA "Crompton-Parkinson" 1,500 r.p.m., 15 kW "G.E.C." 1,500 r.p.m. For full details, write: Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 109)

DIESEL ALTERNATORS in stock, 1 and 3 phase, standard voltages, up to 100 kVA; details post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 108)

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H. WELLS,
Clerk of the Council.

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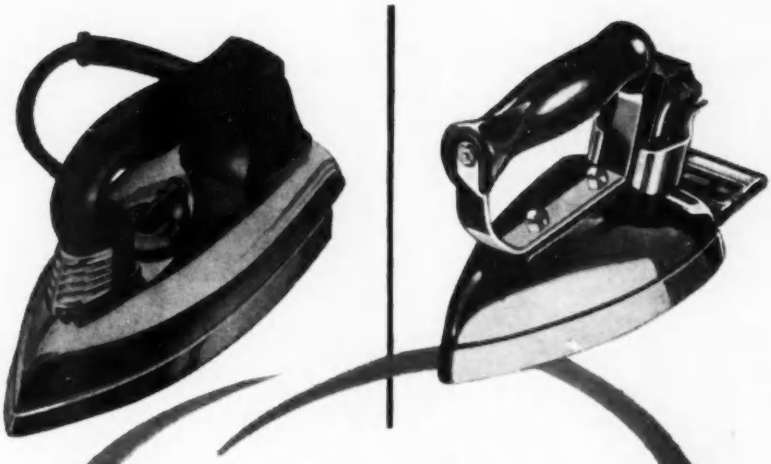

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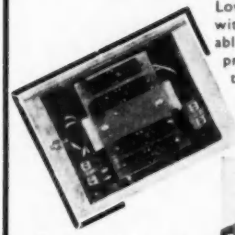

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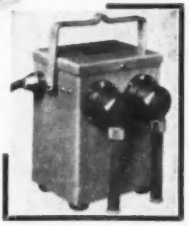

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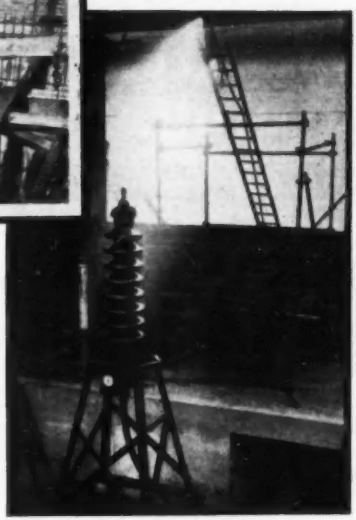

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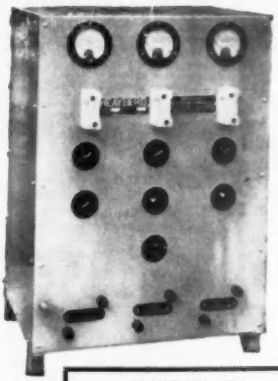

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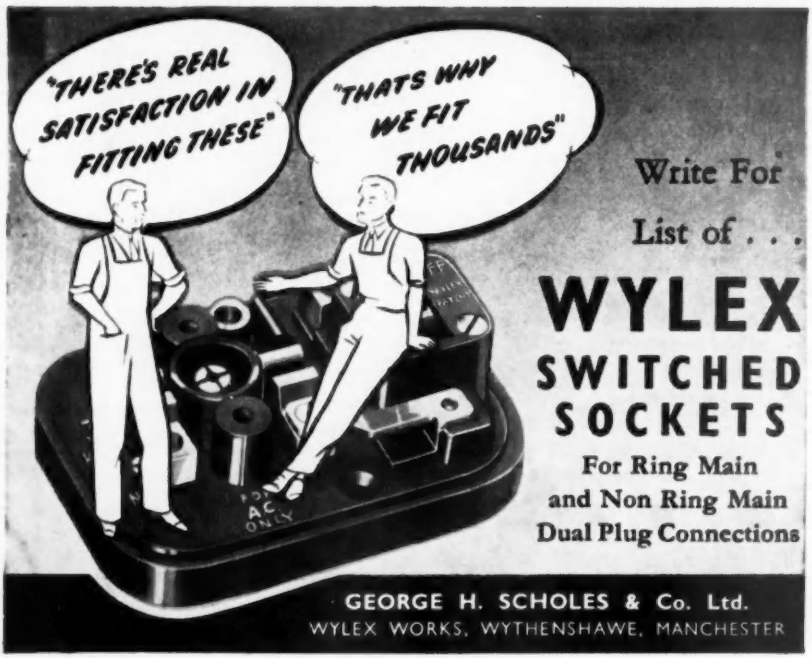

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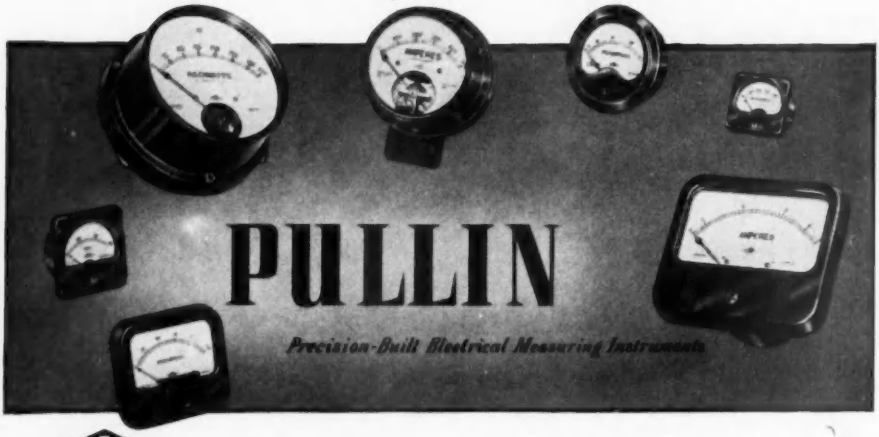

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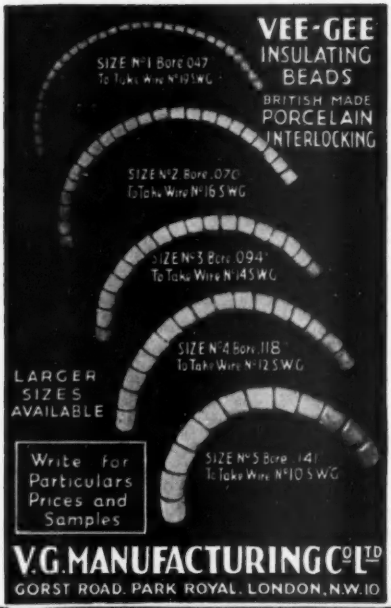

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The G.E.C. Cleaner costs less; that's a great selling point these days and G.E.C. publicity will put it over with vigour. The demand will be created — clinching the sale is up to you!

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ELECTRIC HEATING OF PRESS PLATENS FOR PLASTIC MOULDING: VENEER AND PLYWOOD MANUFACTURE, ETC.

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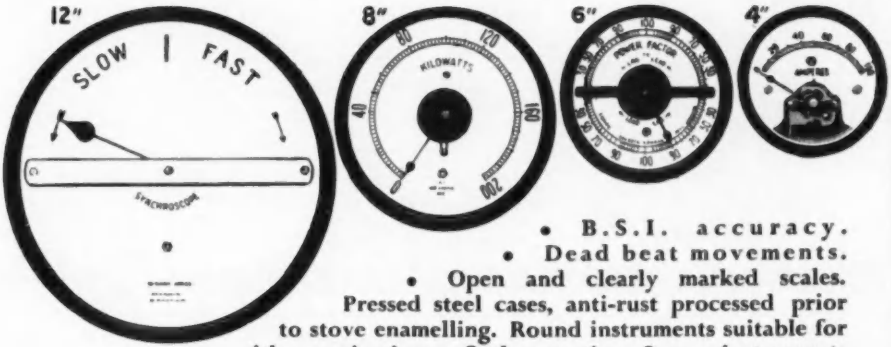
. . . Ammeters, Voltmeters, Wattmeters, Power Factor Indicators, Frequency Meters, Synchroscopes, Tap Position Indicators, Speed Indicators and Temperature Indicators in any size illustrated.



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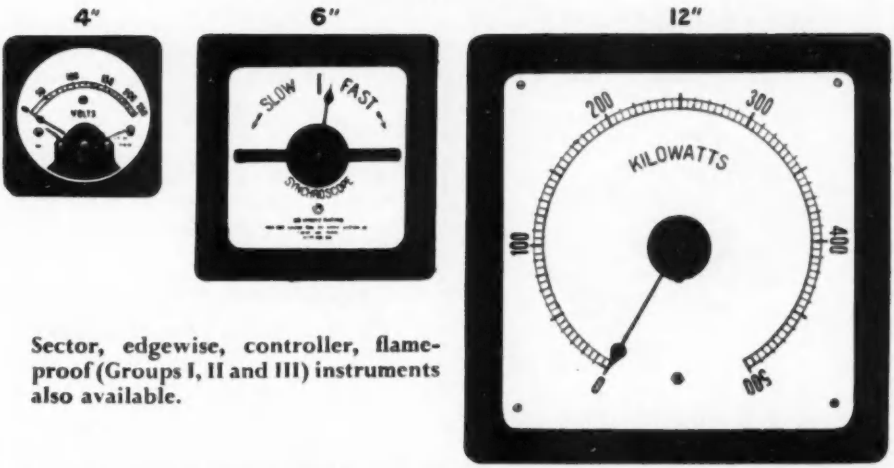

Sector, edgewise, controller, flameproof (Groups I, II and III) instruments also available.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

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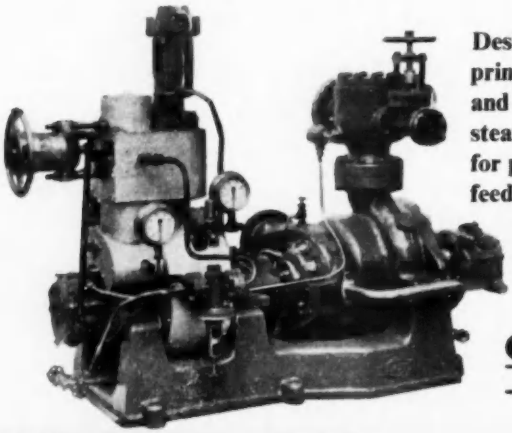

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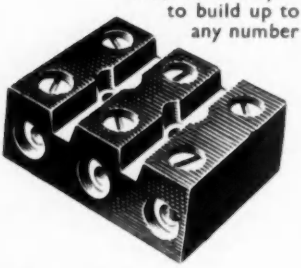
In 2, 3 or 4 "ways" to build up to any number



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PLASTIC MOULDERS
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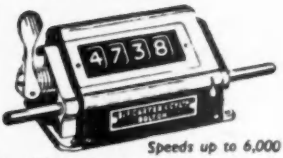

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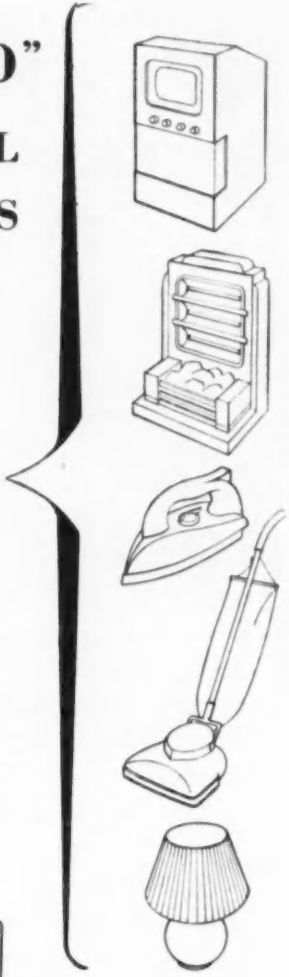

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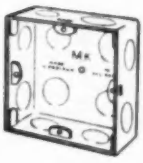

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(In accordance with H.O. Electy. Reg. 29)

Mounted on strong board, varnished and corded for hanging

ELECTRICAL TIMES

Sardinia House, Sardinia St., LONDON, W.C.2.

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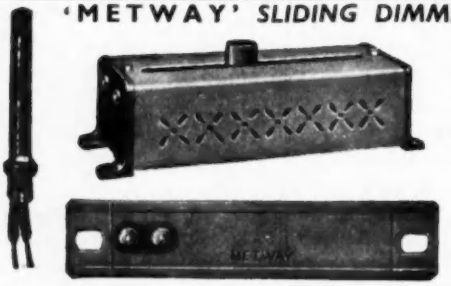

Dimmers are wound on Slate Formers; are continuously rated and fitted with "off" position. Flash tested at 2,000 volts A.C.

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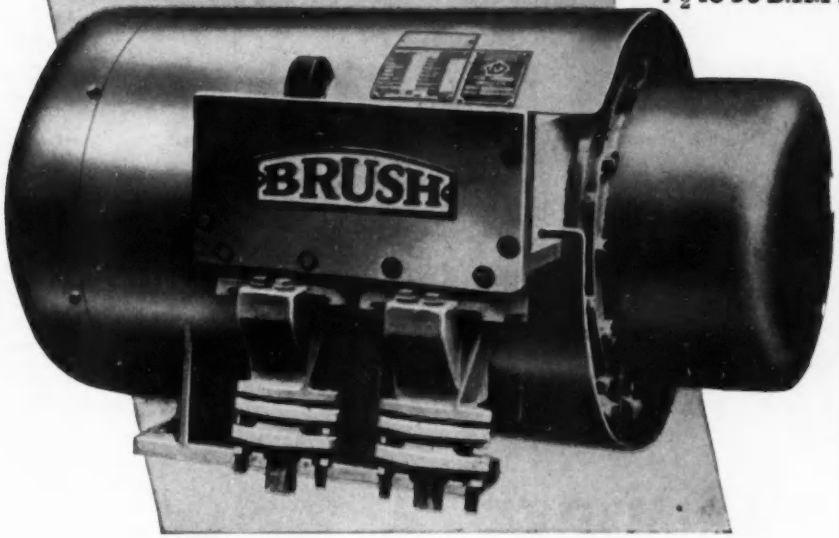
BRUSH

FLAMEPROOF INDUCTION MOTORS

7½ to 50 B.H.P.



These British motors of steelclad construction are available in squirrel-cage or slip-ring types, blow-over fan cooled or plain totally-enclosed. Backed by over 70 years' electrical engineering experience, they are subjected to rigid tests during each stage of manufacture and before despatch.

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No doubt you do make good Press Tool Sets but so do we— quicker and cheaper

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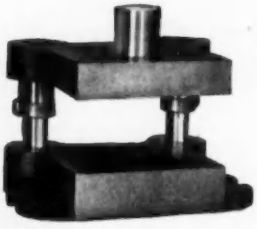

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The Thermostat

controls two values of current input. In the first stage the full loading is switched on for quick heating up of the oven. The thermostat then successively switches to a lower value of current input. Further temperature rise breaks the circuit which is remade at the low value when the temperature falls. Thereafter the thermostat alternates between off and on at the low value unless the oven door is left open, in which case the high loading is automatically re-introduced. The pilot light switches from "bright" on the full loading to "dim" on the low rating and "out" when the circuit is broken. Thus the operator has positive indication that the oven is ready for use when the lamp is "dim" or "out".

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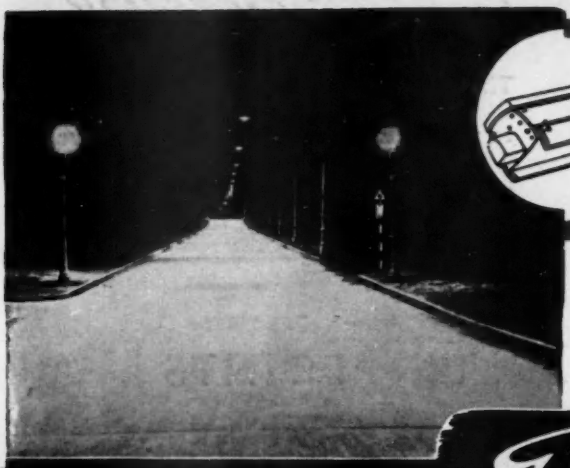

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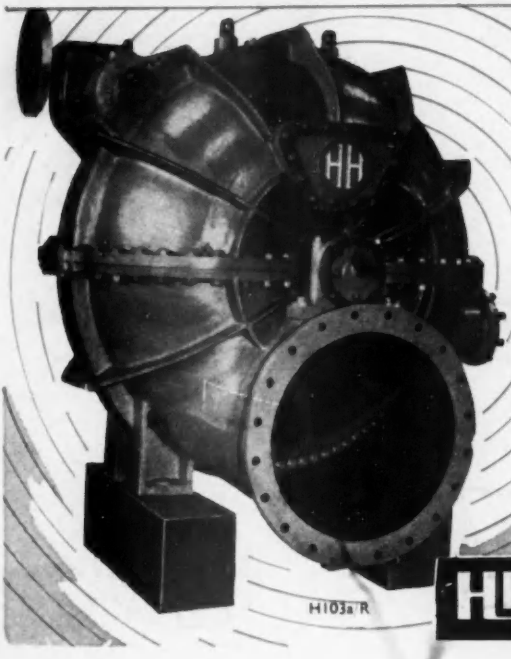

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